UNIV.OF
TORONTO
LIBRARY

Digitized by the Internet Archive
in 2009 with funding from
Ontario Council of University Libraries

http://www.archive.org/details/militarymedicine53asso

THE MILITARY SURGEON

JOURNAL OF
THE ASSOCIATION OF MILITARY SURGEONS
OF THE UNITED STATES

EDITED BY
JAMES ROBB CHURCH
EDGAR ERSKINE HUME

VOLUME 53

290965
25.8.33

WASHINGTON, D. C.
THE ASSOCIATION OF MILITARY SURGEONS
OF THE UNITED STATES
1923

THE ASSOCIATION OF
MILITARY SURGEONS
OF THE UNITED STATES

Incorporated by Act of Congress

Officers 1923-1924

President

COLONEL GILBERT E. SEAMAN

MEDICAL CORPS, WISCONSIN NATIONAL GUARD

First Vice-President

SURGEON GENERAL HUGH S. CUMMING

UNITED STATES PUBLIC HEALTH SERVICE

Second Vice-President

REAR ADMIRAL E. R. STITT

SURGEON GENERAL, U. S. NAVY

Third Vice-President

MAJOR GENERAL MERRITTE W. IRELAND

SURGEON GENERAL, U. S. ARMY

Secretary-Treasurer

MAJOR EDGAR ERSKINE HUME

MEDICAL CORPS, U. S. ARMY, WASHINGTON, D. C.

Assistant Secretary

LIEUT. COLONEL FIELDING H. GARRISON

MEDICAL CORPS, U. S. ARMY

THE
MILITARY SURGEON

VOL. LIII JULY, 1923 NUMBER 1

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE NEWER EPIDEMIOLOGY[1]

BY LIEUT. COL. FIELDING H. GARRISON, M.C., U. S. ARMY
Sternberg General Hospital, Manila, P. I.

EPIDEMIOLOGY is the science of the occurrence, recurrence and spread of communicable diseases in space and time, with a view to the prevention of their devastating effects upon populations by means of knowledge sufficient to predict their movements, velocity and mass action. The history of the subject comprises two successive phases, viz., the earlier or descriptive state, in which epidemic diseases were studied and described, like other happenings in natural history, in relation to time and place of occurrence, and with reference to accompanying meteorological phenomena; and the newer or dynamic stage, in which the mathematical relations of the rise, subsidence and periodicity of epidemics have been obtained and expressed as curves or graphs, and these graphic data reproduced experimentally in laboratory animals. The main protagonists of the earlier phase were Hippocrates, Baillou and Sydenham, whose views have latterly been revived by Crookshank; the mathematical and graphic relations have been obtained by Farr, Pearson, Ross, Greenwood, Brownlee and others. Epidemic diseases were first produced in laboratory animals by Danyz (1900), and first reproduced and consciously studied to establish the actual bases of scientific epidemiology by Simon Flexner and his associates of the Rockefeller Institute (1918–22).

Hippocrates, in his studies of such diseases as epidemic parotitis or the malarial fevers of Thrace and Thessaly, had already acquired the main basic data of descriptive epidemiology. He first endeavored to outline a definite semeiology, separating the wheat from the

[1] From a lecture delivered at the College of Medicine and Surgery, Manila, P. I., on January 16, 1923. Published by permission of the Surgeon General, U. S. Army.

chaff, noted the prevalence and clinical character of certain fevers with reference to locality, condition of the soil, wind, weather, temperature and humidity (the "epidemic constitution") and had some inkling of their tendency to recur at periodic intervals of time. Up to the revival of Hippocratic medicine in the seventeenth century, the subject was neglected, with the solitary exception of Guillaume Baillou, who first described whooping cough (*quinta*) in 1578, and in 1574 postulated the theory of "epidemic constitutions," viz., that the clinical character of a communicable disease prevalent at a given period of time is altered by the climatic or telluric condition obtaining during the period, sometimes to the exclusion of other symptoms or clinical types of the disease.[2]

Sydenham, the reviver of Hippocratic reasoning in medicine, separated scarlatina from measles (1675) and studied the malarial and exanthematous fevers of his time and country in the spirit of the master of Cos. He noted their prevalence in relation to climate, weather and locality and their apparent periodicity. He first classified diseases like plants or animals in a taxonomic scheme and further elaborated the doctrine of "epidemic constitutions" to explain the clinical variations and recurrences of certain diseases with reference to predisposing atmospheric and telluric conditions (Pettenkofer's *Boden* theory). Although Sydenham maintained that final causes are inscrutable, he believed that certain diseases exist, like sub-varieties of species in natural history in a familial relation, e.g., yaws as the parent of syphilis, measles, scarlatina and other exanthems as congeners, the similarity of hysteria, insanity and chorea and their tendency to appear sometimes in pseudo-epidemic form. All this was a tremendous advance upon the view obtaining in the Middle Ages, and among theologians up to the end of the eighteenth century, that epidemic diseases are expressions of divine or demoniac wrath, "scourges of God," the old Assyro-Babylonian, scriptural and pre-Hippocratic view, still obtaining among savages and primitives everywhere. It is symbolized in art in the many sixteenth century paintings representing the disease-devil exorcised from the body by the saint and escaping from the mouth of the energumen or in Arnold Böcklin's painting of "The Pest" (Basel Museum), representing the plague as a

---

[2] Greenwood regards the change of clinical type in "epidemic constitutions" as due to non-specific secondary infections. Alterations of virulence, e.g., the mildness of recent scarlatinas and the heightened virulence of recent pneumonias are conceivably due to alterations in virulence of the pathogenic germ. Rolleston: Jour. Am. Med. Assn., Chicago, 1920, lxxiv, 1495–1497.

winged monster of horrific mien, swooping down from the air upon the terrified population of a mediæval town.

The many valuable accounts of epidemic disease in Thucydides, Lucretius and monkish and civic chronicles of the Middle Ages were neglected, ignored and only first studied by Haeser, Sudhoff and other modern historians. The mediæval epidemics and the methods employed for their prevention are of the utmost historical importance. Through the spread of Christianity and the influence of the Jewish physicians, the old Assyro-Babylonian or Hebraic doctrine of the contagion of leprosy was revived, leading to the compulsory examination (*Lepraschau*), the commitment and isolation of lepers, as in the Mosaic Code. Importation of plague was prevented by the institution of quarantine (*quaranta giorni*) at Venice (1374), Ragusa (1377) and Marseilles (1383). Through the treatment of syphilis by the inunction of mercurials in hospital, the hospital, hitherto a sort of *Nachtasyl* or place of shelter and refuge, came to be known to the public as a place in which the curable sick might be successfully treated (*curabiles, ergo curandi*). The old doctrine of Rhazes that "eight diseases" are contagious, viz., plague, phthisis, epilepsy, scabies (syphilis), erysipelas, anthrax, trachoma and leprosy, was writ large in the municipal ordinance of the city of Basel (1350) and elsewhere; victims of these diseases were rigorously excluded from the Germanic towns and forbidden to handle or sell food and beverages. Pollution of the soil was recognized as a cause of epidemic diseases by the Parliament of Cambridge in 1388. These mediæval triumphs of the old Biblical code of sanitation, often carried out with merciless rigor, were, for the most part, ignored or forgotten in the subsequent centuries. Their significance was not clearly understood until bacteriology had been founded by Pasteur and the true theory of infectious diseases by Koch. Yet, in the Talmud, the presence of diphtheria (*eschara*) in the Hebrew community was to be announced, by a warning blast of the shofar, even upon location and citation of the first case. The English physicians who followed Sydenham, the Huxhams, Fothergills and Withingtons, still studied the epidemic diseases of their localities in relation to the weather, and Richard Bright found such meteorological records of disease kept up in Vienna as late as 1814. One other class of medical records has been of great value to subsequent epidemiologists, namely, the "bills of mortality" started in the seventeenth century, and the records of disease incidence maintained in some of the

English, Scotch and German towns from that period down to the present time. With the aid of these records, Brownlee has been able to plot his "periodograms" or graphs of the periodic recurrence of measles, scarlatina, smallpox and other epidemic diseases in Perth, Glasgow and elsewhere.

The first to study the course and predict the time of subsidence of epidemic diseases from algebraic curves was William Farr, who did this successfully in relation to the English epidemic of cattle plague of 1865–6 and in a subsequent smallpox epidemic. Farr's original epidemic curve was a bell-shaped graph of even, symmetrical ascent and slightly abrupt slope, a graphic expression of "Farr's law," viz., that subsidence along the path of a definite curve is a property of "all zymotic diseases." Farr endeavored to quiet the apprehensions raised in the House of Commons about the bovine epizootic of 1866 by predicting that the rate of increase of the disease would begin to lower rapidly at a certain point and would then go on decreasing until the rate of incidence itself decreased. The actual epidemic rose to a maximum two weeks earlier than he had predicted, but subsided in the early summer, as he had foretold, although at a slower pace than the fall of his hypothetical curve indicated. The corrected curve, with a fall less abrupt and more gradual than its rise, has been ascertained by Brownlee to be the true epidemic curve, identifiable with Karl Pearson's skew curve of Type IV. Sir Ronald Ross has since investigated the symmetrical or ideal epidemic curve and the asymmetrical curves obtained from epidemics influenced by external forces or conditions. He classifies epidemic diseases into: (1) diseases of sluggish course and progression, like leprosy or tuberculosis; (2) diseases of periodic recurrence, like measles or scarlatina; (3) pandemic diseases, like plague, cholera and influenza, which have a tendency to reappear in full force at wide intervals of time. The object of Ross's calculations is to ascertain whether the periodic onset of diseases of the second class may be due to sudden exaltation of virulence of the pathogenic organisms in the body of infected persons, or to environmental conditions favoring their transmission from person to person or to local increase of susceptible material in the affected population. The theory that the rise and subsidence of epidemic diseases is due to exaltation and diminution of the virulence of the pathogenic germ by environmental conditions is due to Pasteur. The statistical or mathematical theory is to the effect that epidemics subside through dying out of the susceptible part of the

population. The curve obtained by Ross for the simplest case, an epidemic curve of the usual bell-shaped type, expresses the theorem that infectivity ratio is constant and proportional to the number of persons affected, favoring the hypothesis that the rise of epidemics is due to preponderance of susceptible material and their fall to its diminution by death or acquired immunity.

So far, then, these algebraic graphs afford a true picture of the rise and fall of an epidemic and a possible means of ascertaining the time of its height and subsidence, but they do not tell us *why* a certain proportion of the population is found to be susceptible at the onset of the epidemic, nor why another portion remains unsusceptible at its subsidence. The Sydenham theory of epidemic diseases was revived by F. G. Crookshank, of London, in connection with the influenza pandemic of 1918–19.[3] From the data of this pandemic, Crookshank, Hamer and others drew conclusions of considerable importance as to the remote ætiology of the major epidemics, but, better still, with reference to the necessity of devising more statesmanlike programs for preventing their occurrence and more comprehensive war-plans for meeting and defeating them when they appear. Such measures, Crookshank maintains, must be concerted by "the statesmen, the sanitarians, the physicians and the bacteriologists," doing team-work for the common good. Crookshank's main argument is in the nature of an analogy between the pan-European War and the influenza pandemic which followed in its train and which eventually proved more destructive, relatively, than the World War itself. Both phenomena were of remote, multiplex causation, some of it undecipherable, as being connected with happenings in the distant past, while, apart from these sets of initial conditions, both had local predisposing and exciting causes, which are more easily ascertainable and definable. The World War began with the usual hand-to-hand fights of skirmishers, followed by group-contests of infantry and artillery, working up *crescendo* to a general pandemonium of great guns and high power explosives, Gotha and gas attacks, whizz-bangs, *Flammenwerfer* and submarine warfare, eventually affecting the remote confines of Asia, Africa and America. The influenza pandemic was ushered in by local outbreaks not clearly recognized as influenza at the start, spreading over the world with the velocity and mass-action of the plague and cholera pandemics of the past, and with baffling mani-

[3] Crookshank: Jour. Roy. San. Inst., Lond., 1920, XLI, No. 2. Also: Military Surgeon, Wash., 1921, XLVIII, 172–179.

festations in the pleuro-pulmonary tract, the accessory sinuses and the cerbro-spinal system. Both arose with the apparent spontaneity of a sudden explosion and spread like a prairie fire. To attribute the ultimate causation of such a pendemic to a single pathogenic bacillus or even (as happened) to a combination of different bacilli, is as futile, Crookshank thinks, as to maintain that the European War was caused by the explosives and projectiles with which it was carried on. The European War was initiated, not by the existence of death-dealing projectiles, but by an order issued by some elderly general miles behind the battle front, who in turn was activated by a declaration of war, motivated in the last analysis, by complex political and diplomatical intrigues, the results of wars covering centuries of back history.

In like manner, a major epidemic is of remote and multiplex causation. Crookshank defines the influenza pandemic as "a co-ordinate series of happenings, in which individuals and particular sets of circumstances play their part, no doubt, but still, which is ultimately caused by forces or agencies widely affecting the whole set of conditions of life upon this planet"; some of these forces are "telluric or cosmic, involving periodic variation in the condition of all forms of life, human, animal, vegetable and even microbic." While this may seem, at first sight, the usual "flight into mysticism," to which the human mind is ever liable when confronted by the unknown, yet it must be plain that the general unrest and misery of the wandering West European peoples following the downfall of the Roman Empire, the squalid, overcrowded status of the mediæval walled towns, the debilitation of the people by the successive wars, famines and inundations, the condition of the soil, as also sundry meteorological disturbances, had something to do with the spread of leprosy, plague, syphilis and the other diseases probably brought in by the Crusades. In the Latin chronicles of the sixteenth and seventeenth centuries, clustering around the great influenza pandemic of 1580, Crookshank has found cases which read exactly like the clinical reports of encephalitis lethargica published in medical journals, and these, along with the successive epidemics of ergotism, botulism, *Kriebelkrankheit* and sweating sickness, may have been so many different manifestations of pandemic influenza. The influenza pandemic of 1580 went round the world with the same velocity as in 1918–19; in 1712 and 1801 the epidemic manifestation assumed the nervous form; in 1829 it appeared as "acrodynia," attributable to food-poisoning; in 1840 it concentrated on the

gastro-intestinal tract; in the summer of 1918 it was remarkable for rheumatic, ague-like or dengue-like manifestations; while in the fall of 1918 it was characterized by fatal pneumonias and empyemas or by local infection of the frontal sinus.

In influenza, the main pandemic wave may be initiated as well as followed by successive waves of smaller outbreaks, each in the nature of a minor epidemic, often utterly different in semeiology from the influenzas of the classical Leichtenstern type. Hamer believes that influenza, cerebro-spinal fever, acute poliomyelitis and encephalitis lethargica are merely clinical variants or diverse manifestations of one basic virus. Checking up Crookshank's view by the recent careful study of Hans Zinsser,[4] we find that the earlier manifestations of the influenza of 1918–19 baffled both clinicians and bacteriologists, that the Pfeiffer bacillus was not found in the earlier cases (due to defective technique and failure to make cultures from the naso-pharynx), that this bacillus was subsequently found in normal throats, in conditions markedly different from clinical influenza, and as a symbiant in measles, whooping cough, etc.; that inoculation experiments with pure cultures have been mainly unsuccessful; that many distinct strains were isolated, so that the secondary pneumonias and empyemas involved streptococci, pneumococci and other pathogens. While Zinsser shows that the Pfeiffer bacillus and its toxins will account for most of the phenomena of ordinary clinical influenza, the above conclusions indicate how much remains to be done before the bacteriologist can clearly account for epidemic or pandemic manifestations of the disease. The fact that influenza was prevalent in China in March, 1918, spreading to the Japanese Navy in April, that it reached Spain and France in May, preceded by a curious mild febrile disease reported among French colonial (Indo-Chinese) troops on the French coast, points to Asia as the main starting point of the pandemic, as in the case of cholera, plague and leprosy. Important for prophylaxis is Zinsser's generalization that the disease travels no faster than human contact (mechanical convection), as also his general summary of causation:[5]

It seems fairly definite, therefore, that the last pandemic cannot be said to have started in any single endemic focus. It appears to have grown from roots that can be traced back to 1915 and 1916 at least, and according to studies such as those of Pearl it seems

[4] Zinnser: Medicine, Balt., 1922, i, 213–309.
[5] Zinsser: *op. cit.*, 291.

quite possible that none of the crowded communities of the world had become entirely freed from the disease after the 1889 outbreak. It is not impossible, however, that the last pandemic may have been epidemiologically abnormal owing to the unusual conditions incident to war, the creation of great foci of respiratory transmission in the camps and the transportation of infected men in large numbers under conditions eminently suitable for the dissemination of disease. Moreover, there was a constant rearrangement of human association, a constant addition of fuel to the centers of epidemic prevalence, in the form of recruits sent to camps, American susceptibles sent to France and transport-infected individuals unloaded into dense populations in both directions between Europe, America and other continents. It is a suggestion at least worth considering whether this pandemic might not have been delayed in its advent, or perhaps limited in its scope had there not been a state of war throughout the world.

Considerable light has been thrown upon the rise and subsidence of epidemics and the subsequent production of epidemic waves by the studies carried forward under Flexner by his associates in the laboratories of the Rockefeller Institute during 1918–22.[6] These studies were initiated by an accidental epidemic of mouse-typhoid among laboratory mice of the institute, beginning April, 1918, and lasting two and one half years. This particular mouse population, being employed for cancer experimentation, was kept approximately at 2,500 to 3,000 individuals, the total population affected (4,282) showing a mortality of 1,463 (34 per cent) during 1918–20. The death rate doubled the average weekly rate in September, ascending in stair-case progression thereafter to the peak (November 19), the descent of the curve having the usual slight lag noted by Farr and subsiding to normal in January, 1919. The whole epidemic curve was made up of six waves. During the epidemic period, the birth rate was low, but a gradual accession of new births was followed by a short, swift single wave epidemic (typical Farr-Pearson curve) in March, 1919, the total mouse population being reduced to 1,250 individuals by May. Vaccination of half the mouse population at this time, while conferring practical immunity upon the vaccinated, did not lower the existing death rate; but during the relatively quiescent period which followed, the population was steadily replenished by new births, reaching about 4,000 in May, 1920. A succession of three small epidemic waves followed in May–June, climbing step-wise to a high peak in November, the number of deaths in this last wave exceeding those

[6] Flexner, Lynch et al: Jour. Exper. Med., Balt., 1922, xxxvi, 9–15.

of November, 1918. Vaccination of the remaining population in December, and subsequent vaccination of all mice with mouse-typhoid I and II, kept the outbreak down to a relatively low level thereafter. Of the 4,282 mice in the total population (1918–20), 220 survived the November, 1918, wave, and it was noticeable that 130 or 60 per cent of these apparent non-susceptibles succumbed to this November wave, although the mortality of the 4,062 new mice was 1,333, or only 32.8 per cent.

Acting upon this hint, Flexner put Amoss and Webster upon the study of experimental or artificially induced epidemics of mouse typhoid in mouse villages during 1919–20. These villages were made up of cages of 5 mice each, placed arow on metal shelves and kept sanitary by exclusion of insects and vermin and by weekly cleansing. Thus conditions obtaining in average houses and city streets were reproduced. Spread of infection was left to accidental feeding or transmission by the hands cleansing the cages. Exposure of the normal mice to a few mice fed on the culture was found to set up sporadic outbreaks of low mortality and low cage-attack rates and self-limited in time. Epidemic outbreaks were induced by bringing in fresh material. As in the accidental epidemic of 1918–20, it was found that whenever a new increment of fresh mice was brought in, the older non-susceptible mice were attacked along with the new susceptibles. Successive epidemic waves, each self-limited in time, were set up by the repetition of this process, until different groups of old surviving non-susceptibles were wiped out, the ultimate survivors thus coming from later increments.

The maintenance of epidemic waves is thus dependent upon introduction of new material, the rise of each wave being due either to exaltation of virulence (Pasteur) or (expressed quantitatively) to the mass-action of rapidly multiplying bacilli (Rosenau). The weathering of successive epidemics does not confer ultimate "immunity" in apparent non-susceptibles, although vaccination does confer individual immunity to "doses *per os* of the living culture, fatal to control mice." Subsidence of epidemic waves is apparently produced by acquired immunity or by the natural resistance of certain individual mice and bacilli having "an innate tendency to return to an average infectivity." "Among the new mice are certain individuals so highly susceptible as to react to small numbers of bacilli of average infectivity." Here, then, we have a simple explanation of some of the phenomena of epidemiology, as reproduced under ideal or laboratory conditions. Some of the facts had already

been noticed in military epidemiology, e.g., the tendency of measles epidemics in camps to suddenly disappear, "like a flight of birds," unless new epidemic waves are started by the arrival of fresh recruits.

Prior to the above experiments, Danysz, in attempting wholesale extermination of rats by a mouse-typhoid strain (1900),[7] noticed that cultures of pathogenic strains lose their virulence after successive passages through three or four individuals, but that survivors of experiments with virulent cultures may later succumb to feeding with cultures of average virulence. Bainbridge (1909)[8] noted that the sweeping death rate among wild rats kept under artificial conditions decreases as these conditions approach those of nature. Topley (1920)[9] was able to keep up a regular recurrence of epidemic waves in mice, apparently without time limit, by constantly introducing new susceptible material. He also noted that survivorship does not necessarily confer immunity, although an infected population with no increments from the outside will always outlive one rendered newly susceptible by the addition of fresh material. In his introduction to the Rockefeller Laboratory studies, Flexner criticizes the recent English revival of the Hippocratic theory of epidemic constitutions as savoring of mysticism. At the same time, he admits the difficulties and limitations of the bacteriological line of attack as follows:[10]

That the mere occurrence of potent microorganisms does not suffice to produce an outbreak of epidemic disease is a commonplace of bacteriological knowledge. The conditions are not so simple as that, and, in their greater complexity they include not only the various qualities of the microbe but also of the host and, as well, their many reactions, one upon the other.

Crookshank's practical conclusions are, in short, of more immediate importance, provisionally, than the theory of remote or cosmic causation, but the latter, none the less, constitutes an effective check upon our human tendency to "explain" everything in terms of the pathogenic bacillus, our tendency to frame the mind about a plausible explanation and then hang it up in a state of suspended animation. Pottenkofer, in fact, required, for the production of a specific infectious disease, the pathogenic microorganism, the organism invaded by it, and a certain X factor or *tertium quid,*

[7] Danysz: Ann. de L'Inst. Pasteur, Paris, 1900, xiv, 193.
[8] Bainbridge: Jour. Path. and Bact., Lond., 1909, xii, 443.
[9] Topley: Jour. Hyg., Lond., 1920–21, xix, 530.
[10] Flexner: *op. cit.*, 11.

which might variously be the relative resistance or susceptibility of the patient's body to the specific infection, the thermodynamic relation of the pathogenic germ to its surrounding medium or such predisposing factors as local, seasonal, climatic, meteorologic, telluric or even cosmic conditions. Epidemic phenomena may now be reproduced experimentally but it remains to be seen whether the two factors, pathogen and patient will account for pandemics, i.e., epidemic manifestations of world magnitude. Epidemiology, as Vaughan maintains, not only antedates bacteriology, but is also of broader scope. The newer epidemiology demands a more exact semeiology (as urged by Sir James MacKenzie), more definite knowledge of the pathology of the specific disease, its modes of transmission and paths of infection and certainly more exact knowledge of the effects of climatic, meteorologic, telluric and social conditions. Thus, the management of carriers, the fact that the carrier of a communicable disease is a greater danger to the community than the disease itself, is of vast social importance in modern life, as was amply demonstrated by military experience in the World War. The science of carriers and of mechanical modes of convection is, in fact, the most important combination which bacteriology has yet made to epidemiology, as witness the telling experiments made in the Rockefeller laboratories.

Again, it is no longer of paramount importance to ascertain the exact pathogenic germ of a disease. If its mode of transmission is known, it can be prevented without reference to its ultimate ætiology, as shown by earlier experience with leprosy, plague and cholera and more recent experience with the insect-borne diseases. The respiratory affections, transmitted by nasopharyngeal secretions, and including such diseases as measles, meningitis and leprosy, are the admitted crux of preventive medicine. In the case of influenza, there is the additional difficulty that an attack confers no immunity, whence everybody is potentially susceptible. As Vaughan puts it: "When an epidemic of measles strikes a community, only the susceptibles can acquire the disease, and, as a rule, these make up, in civil life, only a small part of the community. When influenza strikes a nation all are susceptible." The merit of Crookshank's view of pandemic influenza therefore is contained in the famous sally of Captain Cuttle: "The bearings of this observation lies in the application on it." To cope with any future pandemic of the magnitude of the post-bellum influenza of 1918–19 will require not only considerable knowledge of the statics and dynamics of epidemic

diseases in their social relations, but also sanitarians who will measure up to the stature of medical statesmen. A statesman is nowise "a dead politician" but a public servant who, at all times and places, prefers the greatest good of the greatest number to private or personal interests." Public service of this high character has already been rendered in legislative assemblies of such medical men as Rudolph Virchow, Théophile Roussel, Sir Michael Foster and Lord Ilkeston, forerunners of the period predicted by Jacques Leob when the voice of science will be heard in governing bodies and perhaps even legislators will be scientifically trained, like our military, naval and diplomatic services, as an expert class apart, for the proper performance of their functions. In the pathetic attempts which have been made in our country for a scientific organization of public opinion (usually frustrated by the cable-crossing of local and private interests), public sanitation has not always had free play, on account of the prevailing ignorance of its large scope and true aims. A case in point is the plaint of Herbert Spencer and Lecky that science is preventing epidemic diseases from weeding out the weak, of which Vaughan wittily observes: "Herbert Spencer may have been a great philosopher but he certainly was not an epidemiologist."

A word as to the control of epidemic diseases by sanitation in the Philippines and the Far East.

In the Philippine Islands, during the period of American occupation, great progress has already been made in the prevention of communicable diseases by the Medical Department of the U. S. Army (in the first instance) and the local health administration. The major epidemic diseases, cholera and plague, although always endemic in Asia, have been practically exterminated in this archipelago. Lepers are segregated on the island of Culion, and while many are still at large in the remote barrios and mountain fastnesses, voluntary or facultative commitment will surely be the order of the day when successful treatment holds out the possibility of permanent cure. Leprosy disappears with the saner, cleaner habits of civilization. In the Philippines, the current belief is that the disease is spread and disseminated by overcrowding and local squalor of the barrios. The native Filipino is gregarious, fond of his family and fellows, and tends to herd closely both in habitation and public conveyances. There is also the possibility that leprosy may be transmitted by biting insects like acarus and demodex which infest the bodies of the natives. The exact

modes of transmission of leprosy are still obscure and it is difficult to obtain a truthful history of early cases, but if efficient treatment becomes accomplished fact, the rounding up of all remaining lepers at local clinics will be only a question of time. Overcrowding has much to do with the spread of frambœsia, which is now very efficiently treated at the Yaws Clinic at Paranaqua, Malolos and other endemic centers of the disease. Through the same administrative device, yaws is fast disappearing from the Malayan states. Parham's experience with yaws in Samoa, where most of the population are affected, goes to show that Polynesian yaws confers immunity from syphilis. The question arises: Is yaws (as Parham maintains) a kind of Stone Age syphilis or is Polynesian yaws a mild congenital phase of syphilis implanted by earlier navigators?

Beri beri, which sometimes takes on pseudo-epidemic manifestations, is no longer epidemic in Manila, although a certain amount of infantile beri beri is constant. The cases brought into the Philippine General Hospital usually come from Cebu and the outlying provinces and develop in Manila through change to a faulty diet. Beri beri requires for its production that the diet should be monotone of carbohydrates. It is a true expression of the monotony of the tropics, both in respect of climate and food supply and modes of every-day living. In infantile cases, the vitamine deficiency is supplied by administration of tiqui-tiqui extract; in adults, by change of diet from polished to unhusked rice. Smallpox is now controlled, as elsewhere, by vaccination. The principal communicable diseases affecting the Army and the civilian population are tuberculosis, malarial and typhoid fevers, dysentery, hookworm, dengue, influenza and the usual infantile infections, measles and whooping cough. The tuberculosis survey of the different military stations recently instituted by the Army Research Board shows 7 per cent of active and 23 per cent inactive tuberculosis (total 30 per cent) in Filipino troops. This tallies closely with what Sir Leonard Rogers found in India. In the tropics, the disease is transmitted by the overcrowding and unsanitary condition of native habitations, the omnipresent dust and the constant hawking and spitting which accompany tropical colds. But, apart from colds, spitting is an inveterate habit among Filipinos. In the steamy, sticky atmosphere of Manila, colds are easily engendered in overheated, perspiring bodies exposed to prevailing winds, and when the bronchial infection is tubercular, it may, according

to one school, lead to pulmonary infection, a nidus for tubercle.

Of the dysenteries, the amœbic variety is far less frequent than is commonly supposed, as shown in the valuable report rendered by Major James C. Ash, M.C., and Prof. F. G. Haughwout (Bureau of Science) on dysentery at Fort Mills (Corregidor Island) (1921–22). This report stresses the necessity of routine competence in microscopic diagnosis and the need for improving tropical laboratory service in this regard. In the military and residential quarters, dysentery and typhoid are easily avoided by drinking only standard water furnished by the Utilities Department, by eating only well-washed fruit or well-cooked green vegetables, and by the use of coolers in which manhandled ice does not come in contact with potable water. The Filipino cook and house boy, when recruited from the barrios, is not as cleanhanded as the old-time Chinese servant. "If you would be happy, keep out of the kitchen" is a proverb among American lady residents. In the avoidance of parasitic infections and possible cholera, celery and lettuce from the States are preferable and preferred to the province-grown articles. Hookworm infection is, of course, widespread, and liable to attack children, but is easily treated by the usual anthelmintic remedies. The principal safeguards against dengue and malarial fever are the mosquito net and the screening of houses, which is sometimes ineffective in case of jerry-building, as mosquitoes let in by cracks in the structure will breed continuously in the damp bathrooms or may come in as larvæ via the tap water. Mosquito eradication by brigade activities is a well-nigh insoluble problem in the tropics. In the rainy seasons the innumerable mud puddles and squares of lush vegetation within the city limits and the LaTene (Lake Dwelling) practice of rearing barrios on stilts above pools of slimy, stagnant, evil-smelling water for purposes of house drainage, all conspire to accelerate mosquito breeding.

Public sanitation in the Philippines is let and hindered by the old Spanish ritual of red tape, rendered all the more complex by a highly elaborated and numerous bureaucracy, and in the provinces by the feudal domination of the local caciques. It is well known that if a fraction of the energies expended in bureaucracy and war were deliberately applied to the wholesale destruction of man-killing beasts, poisonous serpents and disease-bearing insects, the sanitation of tropical countries would be well on the way toward accomplished fact. In this regard, the East might set an example to the West in destroying the enemies of man rather than man himself.

THE USE OF THE YERKES-BRIDGES POINT SCALE IN INTELLIGENCE TESTS[1]

By Major A. T. COOPER
Medical Corps, United States Army

A RECENT circular calls the attention of medical officers to the necessity of having recourse, at times, in the case of recruits and others to intelligence tests, in order that the native intelligence may be measured and the mental age determined. The circular in part states:

In order that the medical examiner may certify that the recruit is mentally qualified for service in the U. S. Army, it is not ordinarily necessary to determine the applicant's *educational qualifications.* It is necessary, however, that the applicant be found mentally efficient, i. e., provided with *average native intelligence.* It is obvious that the applicant be able to—

(*a*) Understand, remember and execute military orders appropriate to the grade of private.

(*b*) Be *capable of learning* the duties of a private soldier.

It must be borne in mind that the advances in the art of war, modern weapons and their uses, require a higher degree of intelligence on the part of the recruit than formerly. In cases of doubt on the part of the examiner, recourse to ordinary intelligence test and the Binet-Simon test (Sanford revision) should, of course, be had, which not only reveals the degree of mental defect but often leads the way to the diagnosis of mental pathology.

In conducting the mental age test the Binet-Simon test (Sanford revision) is suggested.

To many medical officers the conducting of a mental age test seems to be of such a technical procedure that they may hesitate to attempt it, and consider that only a physician specially trained in psychiatry is qualified to carry out the test and thus able to arrive at an approximate estimate of the mental age of a recruit or soldier, or the quality of their native intelligence.

The frequency with which medical officers are called upon to pass on the mental state of some person in the military service, such as a soldier on whom a psychiatric examination may be indicated, i. e., prior to a court-martial, or applicants desiring to enter the military service in whom there may be a question as to their native intelligence or mental age, should incite every medical officer to familiarize himself with some procedure to be followed in order to determine a person's mental age.

---

[1] From the Medical Service, Station Hospital, Fort Benning, Georgia.

At Fort Benning the medical service has adopted the Yerkes-Bridges point scale along with the Binet-Simon test examination for use in estimating the mental age and the native intelligence of individuals in whom it is thought desirable that such an estimation be made. This test does not take the place of the Alpha test, i. e., the high grade literate test, in educated adults, but is to be used only on those whose mental age is preadolescent. The Yerkes-Bridges test is a modification of the Binet-Simon test. Practically the same equipment is used and many of the tests are identical. This test has been used because it appeared to give more constant and accurate estimation of the mental age of preadolescents and leaves less to the judgment of the examiner who is conducting the test. The principle of the test and its technical phase is not hard to master. In a few hours' study one can easily become proficient enough to conduct this test with the proper equipment. This mental age test consists of various questions to be answered and certain things that the individual being examined is asked to do. The person is graded on the character of his replies and performance of things he is asked to do. These gradings it is possible to mark within very narrow limits, as the character of an answer to a question or test is by the nature of the question circumscribed. If directions are followed, identical results by different examiners are practically always obtained (by examiners is meant the average medical officer who has familiarized himself with the test).

There is herewith submitted a copy of the record blank used at Fort Benning in rating the performance of an individual who is being tested. This sheet is an adaptation of the record blank used at the Boston State Hospital (Psychopathic), and is shown on pages 136 and 137 of "Point Scale for Measuring Mental Ability," by Yerkes, Bridges and Hardwich (published by Warwich and York, Inc., Baltimore, Md.), to which publication the reader is referred. The answers to each test are graded as described by these authors in this work and the sum of the total credits made by the individual referred to the charts published and the mental age obtained. This test, the writer believes, is well adapted to the military service and is an attempt by the above authors to construct a test for preadolescents over three years of age. It provides for partial credits and covers a preadolescent's mental range pertaining to the common mental functions.

The writer has become partial to this point scale test because

STATION HOSPITAL—Fort Benning, Georgia

Date.....Record Blank for Yerkes-Bridges Point Scale Examination

Examined by.....Age.....Mental Age.....A.....

Name.....Date of Birth.....Nationality.....Total Credits.....

Test	*Credits*
1. Chooses, twice, prettier in each of three pairs of pictures, (1 each).	
2. Sees picture lacks: (*a*) arms; (*b*) nose; (*c*) mouth; (*d*) eyes. (1 each).	
3. Compares, twice: (*a*) Lines, 5 and 6 cm. (1)	
(*b*) Weights, 3 and 12 grams. (1)	
(*c*) Weights, 6 and 15 grams. (1)	
4. Memory span for digits.	
(a) 374. 581. (1)	
(b) 2947. 6135. (1)	
(c) 35871. 92736. (1)	
(d) 491572. 516283. (1)	
(e) 2749385. 6195847. (1)	
5. Counts backward: 20-1 (4); 15-1 (3); 10-1 (2); 5-1 (1).	
6. Repeats: (*a*) It rains. I am hungry. (1)	
(*b*) His name is John. It is a very fine day. (1)	
(*c*) The sun is very large and red. Our train was more than two hours late. (2)	
(*d*) It is not necessary to hurt the poor little birds. It is night and all the world is asleep. (2)	
7. Reaction to three Binet pictures: enumeration, (1 each); description, (2 each); interpretation, (3 each).	
(*a*) Man and boy	
(*b*) Man and woman	
(*c*) Man	
8. Arranges weights: two trials. All correct but one (1); correct (2)	
Trial 1. Trial 2.	
9. Compares: (1 or 2 each)	
(*a*) Apple and banana	
(*b*) Wood and glass	
(*c*) Paper and cloth	
10. Defines in terms of use, (1 each); superior to use, (2 each).	
(*a*) Spoon	
(*b*) Chair	
(*c*) Horse	
(*d*) Baby	

Test	*Credits*
11. Resists suggestions: (1 for each of three resistances).	
12. Copies (on back of this sheet) (*a*) square (1 or 2); (*b*) diamond (1 or 2).	
13. Gives words for three minutes; 30–44 (1); 45–59 (2);	
60–74 (3); 75– (4). 1st half minute. 2nd	
3rd 4th 5th 6th	
14. Writes (on back of this sheet) sentence containing Boston, money, river.	
Three words in two (2); three words in one (4).	
15. Comprehends questions: (2 each).	
(*a*) Missed train	
(*b*) Someone unkind	
(*c*) Action versus words	
(*d*) Forgive easier	
16. Draws (on back of this sheet) designs from memory, after 15 sec. exposure. (*a*) (1 or 2); (*b*) (1 or 2)	
17. Sees absurdity: (1 each)	
(*a*) Swinging cane	
(*b*) Unfortunate cyclist	
(*c*) Three brothers	
(*d*) Guide-post directions	
(*e*) Last car	
18. Puts dissected sentences together: (2 each)	
(*a*) My teacher	
(*b*) A good dog	
(*c*) We started	
19. Defines: (*a*) Charity (2)	
(*b*) Obedience (2)	
(*c*) Justice (2)	
20. Analogies: (1 each)	
(*a*) Oyster is to shell as banana is to	
(*b*) Arm is to elbow as leg is to	
(*c*) Head is to hat as hand is to	
(*d*) Truth is to falsehood as straight line is to	
(*e*) Known is to unknown as present is to	
(*f*) Storm is to calm as war is to	
Total.....	

of the provision for partial credits or points. Scoring by points tends to minimize the personal equation of the examiner and the more difficult reactions are weighed and the results are so expressed that a more exact account of the individual's mental capacity is obtained. These advantages are more fully outlined by the authors in the test mentioned above. For instance, in the Binet-Simon method no credit is given in counting backward from twenty unless the entire number is counted correctly. In the point-scale method, partial credits are given if the person being tested counts from 15, 10 or 5 to 1, correctly. In making many tests it soon becomes evident that a person has a higher developed intelligence who can count backward from ten than one who fails completely—that is, one who is entirely unable, possibly, to grasp what is desired. In the Yerkes-Bridges test the one who counts from 15, 10 or 5 backward correctly is given proper credit. So, as pointed out by the originators of the test, scoring by points tends to minimize the influence of the personal equation of the examiner. This, as a rule, tends to lessen the number of doubtful cases.

The giving of this test is not a difficult matter and the securing of an accurate mental rating in all mental cases and doubtful recruits is often of great assistance to medical officers. With this in view the writer hopes that this short article may be of some assistance in bringing the point-scale test to the attention of medical officers who, like the writer, are not particularly trained in psychiatry but upon whom has often fallen the necessity of estimating the mental age of a recruit or a soldier.

THE SUPPLY FUNCTIONS OF THE MEDICAL OFFICER

By Major N. L. McDIARMID
Medical Corps, United States Army

(With one illustration)

MOST OF US who have through more or less arduous study acquired the title Doctor in Medicine are rather proud of it and are loath to leave the precincts of the strictly professional field. As army officers we have found that there are frequently occasions upon which we are shunted off from the work that we consider our own and occasions when we have but little opportunity of pursuing it. Sometimes we are even resentful of the lack of opportunities or of the duties that require our thought on lines entirely away from medicine.

Notwithstanding the fact that articles have repeatedly been written outlining, as the *raison d'être* of our corps, those duties strictly military, we yet cling to our first love. This is notwithstanding, perhaps, that we have a better appreciation of the real purpose of our corps than do many line officers who still hold to the idea that our only function is to treat the sick in the posts.

And yet even in connection with those professional duties which we love there are certain functions that we have to perform that our professional brethren in civil life need not bother with. In our hospitals we are not only physicians but administrators as well. We combine the functions of the staff with those of the superintendent. It is our function not only to treat the sick but to see that the supplies and equipment needed for that purpose are available, that they are properly cared for and economically expended.

There are certain principles of supply that need but be stated to be recognized as true. Unconsciously or consciously, most of them have been followed by medical officers of any experience. They have become second nature to such officers. To officers who have been more or less by accident thrown into the supply service they are axioms, and to such their importance is exceedingly great. In great emergencies they are of vital importance. Without adherence to them efficiency is decreased, expense increased. With disregard of them confusion exists and failure follows.

To many officers the matter of supplies is a bugbear. Through some unfortunate experience, perhaps, but usually through lack of

interest or ignorance, they consider the care of and accounting for supplies a difficult thing, an intricate affair fraught with all sorts of red tape. Whereas it should be, and is to one with a reasonable knowledge of the system, a comparatively simple affair.

Our responsibility for government property is tied up closely with our authority to demand and to insist upon that full and complete armamentarium necessary to the present-day treatment of the sick. Nor can we shirk our responsibility because we are not interested in supplies nor because we consider them a bore. As medical officers we have accepted an obligation, part of which is to provide such equipment and to care for it, and unless we are capable of performing such functions we are not fully equipped medical officers, however skillful we may be professionally. I am not contending that the care of property is of more importance than the care of the sick and that time and attention required for such professional work should be diverted therefrom for the protection of things of monetary value only, but I do contend that the work can be done with little effort and little time if one has but a fundamental knowledge thereof, and that a neglect of it and a glorification of oneself because of one's ignorance of property is a reflection upon one's own capabilities as a medical officer and an admission of one's ignorance and of one's neglect of the duties for which pay is taken.

Although it has become more or less of a custom to accuse the supply man of concern only in his inanimate things, I am bold enough to state that no one is more deeply interested than is the supply man in the adequacy of those supplies essential to the care of the sick and the relief of suffering at the point where they are needed, and that it is that very concern of his that causes him figuratively to froth at the mouth when he sees waste and neglect at points where supplies are not needed or when he receives requisitions for undue quantities that he knows will not be used, particularly when such requisitions bear on their faces evidence that they have never received from the presumed maker thereof any more attention than that required to watch the progress of the signature that he is appending thereto. Lest it be said that I am drawing a fanciful picture, that I am drawing conclusions from an impossible situation and one that does not exist, it may be well to take up here some of the requisitions that have come to my knowledge.

I should hesitate to accuse any medical officer of not knowing the meaning of the word *unit* as applied to serums. Yet when one receives a requisition for six units of serum antidiphtheriticum and

five units tetanus antitoxin one is compelled either to conclude that the maker was an ignorant medical officer or that he had signed a requisition that he had neither made nor scrutinized. The fact that the latter conclusion was drawn is fair evidence, I think, that the supply man is not always the uncharitable individual that he is considered, and evidence also that he upon occasion is justified in questioning and modifying a requisition. Again, when a requisition of a hospital that has been a going concern for some time, serving the same garrison, asks for the same number of forms required for a monthly report that it does for a weekly, the conclusion must be drawn that the requisition has not been well considered. Under such conditions a modification of the requisition or other unfavorable action does not involve an assumption of superiority on the part of the supply officer.

Most supply men have had some experience in post and camp and are at least a little familiar with the conditions there existing. They are familiar with the way in which requisitions are sometimes made, and they perhaps have to guard against an assumption that they are all made that way. They know how easy it is when something is really needed to have added to the necessary requisition several other items that may perhaps sometime, somewhere be needed, lest the existing supply run out before the next requisition. They know how supplies accumulate, how they are so carefully put away (as sometimes important papers are so carefully filed) that they cannot later be found. They know how careless handling in the storeroom leads to ignorance of what is on hand. They remember how much easier it is to ask for the annual or semi-annual allowance or for a reasonable supply for the period than to check up the existing stock and to make allowance therefor in the requisition.

I remember one requisition presented to me at one of my stations prepared by the noncommissioned officer with the expectation that I would do nothing but sign on the dotted line. His education had led him to believe that that was the customary procedure. Among other things there appeared one bottle of Oleum Tiglii which was, according to the Manual for the Medical Department, one year's supply for a post of that size. Now Oleum Tiglii was used infrequently in my practice, and there were other items that excited curiosity. Moreover, the small amount of all drugs on hand was a subject of interest. It appeared that most of the drugs previously received had been expended. A few days spent in the storeroom

put things where they could be seen and counted, and I remember that we had eleven years' supply of Oleum Tiglii. Of boric acid we had several years' supply, and of quinine, which happened just then to be expensive, we had enough to eliminate the plasmodium from that part of the world, had there been any in that section. Yet the requisition presented to me called for a full year's allowance according to the tables, reporting everything expended.

These are small matters, but they illustrate the point, and multiplied by the number of posts they involve a considerable outlay of money and of, what is more important, the time to purchase, to store, to pack and to ship. In time of peace we can get away with it, but in time of war it is another matter, as will be shown later.

Some years ago Dr. Woods Hutchinson wrote an article telling of the skill developed by certain eastern practitioners of the healing art, who were not permitted to gaze upon the face or body of fair patients, in detecting disease by the study of the patient's hand thrust through a curtain. It was remarkable what the hand revealed. As Dr. Hutchinson developed the thought it was shown that many diseases have definite pathology in the hand which in western medicine are not particularly considered because of the more important signs available, but which in the absence of other symptoms assume importance. Color of the skin and its texture, clubbed fingers and circulation are examples.

Just so is it remarkable what an estimate of a medical officer can be made from a perusal of the requisitions submitted by him. Is he careless? Does he sign everything presented to him or does he scrutinize and either make or insist upon others making balanced requisitions, requisitions that bear upon their faces evidence that some consideration has been given to such an unpopular conception as economy of administration?

The Medical Department is by regulation charged not only with the care of the sick, with the provision of the personnel necessary therefor, but is also charged with the provision of the supplies necessary. Any failure of supplies would render ineffectual the services of the professional men, however skillful.

Two courses are possible. Shall the Medical Corps limit itself to the professional duties with which it is charged and entrust to others (and trust them for) the supplies needed? Shall we become the staff of our hospitals and turn over to others the superintendent's duties? Shall we treat disease and forego all interest in the patient? Not unless we are willing to return to the Dark

Ages. Not unless we have failed to note the progress in preventive medicine and to note the strides in social work and follow-up work being done by hospitals. It is the man that must be treated and not the disease, and everything connected with the man in food, in clothing, in shelter, in conveniences, in comfort, are part of the concern of the organization fighting the condition with which he is afflicted.

The practice of modern medicine requires an armamentarium that is exceedingly intricate, without which, however, the wonderful advances in medicine are not available to the sick and injured. The difficulties encountered in providing such elaborate equipment in time of war for the large number of new hospitals necessary, and particularly in providing it at those institutions in the advanced area, are manifest, and yet, if the soldier is to be given the service that he is entitled to, it must be provided. The importance of supplies cannot be more clearly stated than to say that the rate and extent of the mobilization of which this country is capable will depend not upon the capacity for handling the men but upon the capacity for producing the supplies needed to equip them.

With responsibility should go authority. So the Medical Department has advocated. It is becoming a generally recognized conception that the department that is to use should be empowered to secure those agencies needed to obtain the results desired. Unless we can do better than a layman, the argument falls down. The assumption that medical officers are better fitted than laymen for this work is based upon the fact that they would not only have a better understanding of the needs of the department but a more ready sympathy with the officers making the requisitions and a greater appreciation of the relative importance of the things asked for and a clearer understanding of what is an emergency matter and what routine. As a corollary they alone are qualified and they alone would dare to withhold or to reduce a requisition, and while, as will be said later, this should not be required of them as one of their functions, under some conditions it becomes an essential to the general success of the supply service and to the Army as a whole. It is not always that the ideal of the supply service—namely, to fill all requisitions in full without modification—is possible, and some curtailment must be effected.

The function of the Supply Service is not to prescribe the remedial agents to be used but to secure and distribute those that are needed. If limitations are put upon supplies asked for, if

supply officers exercise a veto power, it is because they are required to do so in order to ensure the distribution of more essential and equally desired articles.

The usual conception of the supply service is developed from the paper work connected with requisitions and property accounting. The instruction given to medical officers is usually little more than a warning that prior to the receipting for property it should be carefully checked to ensure oneself against being "stuck." The supply service is far more than that instruction would indicate. Assuming, as we have, that the Medical Departtment believes that the duty of supplying its equipment should be one of its functions, into what ramifications does that lead us?

It is difficult for one unfamiliar with supply problems to appreciate the ramifications of the sources of supply, and in the late war even those who were most familiar with supplies were frequently surprised at the disturbances of markets and labor conditions that would be necessary to secure some small article called for. The enormous drains made upon material and labor and the burden upon transportation were unprecedented, and all production of raw material and every manufacturing resource was taxed to the limit.

As an instance may be cited the case of platinum-tipped instruments. Several of the shops in Paris had on display a few of these instruments which were desired and asked for by the surgeons. For a long time they were purchased even though they were not standard instruments. Finally, however, purchase was refused, and it was difficult for those requesting them to understand why this should be so. There they were in Paris, and they cost but comparatively little. It is true that labor conditions were such that they could not be replaced and that spare parts could not be had, but that was unimportant. What was of importance was that the French Government had placed an embargo upon their sale unless the United States guaranteed the replacement of the platinum contained. A cable to the United States developed the fact that this was difficult. Russia was then in the throes of a revolution and platinum came from Russia. So the supply of a few instruments already made up depended upon conditions in a foreign country.

The functions of the supply service are divided into Procurement, Storage and Issue, Statistical, Distribution, Inspection, Finance, Cost Accounting.

Procurement.—The first principle involved in procurement is standardization, the necessity for which arises not from any desire to limit individual preferences or methods but from the very desire to ensure at all times and at all places an adequate supply of the item. The word *uniform* is associated in our minds with the military because of the essentiality of uniformity in any military effort. A reduction to the essentials and a standardization of the type alone permit a large moving body to be clothed with certainty. Equally true is the necessity for uniformity in other lines. It is obvious that 100 hemostats of one type can be produced in a shorter period of time than can 20 each of 5 types. The lessened cost is incidental. It is also apparent that if in each of our several depots there must be a stock of each of the 5 types there will necessarily be a much greater total reserve than will be necessary with one type. It is likewise apparent that with 5 different types each using organization will desire a certain quantity of each type, and it is certain that the total number asked for and received will be much greater than if one type were held adequate for all purposes. Thus the difficulties of an adequate supply to the user mount up with each additional type added to the supply table.

The necessity for standardization is even more apparent when spare parts are considered. In the early days of the A. E. F. there were urgent calls for oxygen and oxygen tanks. To meet the need French tanks and apparatus were purchased. The French, however, could not possibly meet our requirements. Neither could they at that time be met from the United States. The British, however, supplied us with a large number of their tanks and with the Haldane apparatus that fits those tanks. Later American tanks in large number arrived. The British tank has a female nipple and the American tank a male nipple. The French tanks were discarded at that time. If on a requisition for an oxygen tank an American tank was supplied, it was almost a certainty that the requisitioner had on hand only the Haldane apparatus; and if on a request for an inhalator a Haldane apparatus was supplied, it was probable that only an American tank was available. The steps necessary to correct this situation need not be outlined.

In standardization and uniformity of equipment in each assembled unit there lies the only salvation of the supply department. This applies not alone to the uniformity of the items supplied but to the method of packing as well. Like numbered packages of such assembled units must be interchangeable so that, when loss occurs

en route, the missing contents are easily identified and readily replaced. No package should be of use to one organization only, for if lost and replaced it would if later found be a dead loss.

The first essential, therefore, of a supply department is concentration upon the procurement of the essentials. In order that this may be done there is required the elimination of nonessentials and duplications from consideration. If later it is found that the production, storage and transportation of other articles can be also accomplished without interference with the supply of these essentials it may be done. This as a matter of fact is what is done in time of peace and our present storage and issue list and our policy on supply for the general hospitals is the result.

In the Study of Procurement which the Surgeon General has undertaken under the direction of the Assistant Secretary of War with a view to Industrial Preparedness for a maximum effort, the consideration of the Storage and Issue List with a view to the elimination of the nonessentials therefrom so far as wartime procurement is concerned, is the first step.

America's greatness as a manufacturing nation rests upon mass production by standardization. And it is only by such methods that the enormous demands for material occasioned by mobilization of a modern army can be met.

Lest it be assumed that this essential standardization and uniformity involve rigidity of equipment, an adherence to types once determined upon, it may be well to quote here a paragraph in the Procurement Plan of the Surgeon General.

Diagnostic and therapeutic measures are so constantly and oftentimes so rapidly and so completely changed as to make necessary a constant study of the supply table. No supply table for the Medical Department can be accepted as final. The essentiality of prompt and scientific treatment of the American soldier to a successful prosecution of war is so obvious as to need but to be stated to be accepted. Nothing would so promptly destroy the morale not only of the army itself but of the American people behind the troops as well, as the suspicion that the treatment given the American soldier was antiquated. A section whose function is to consider new equipment and its desirability for the service has therefore been established. New methods of manufacture may make obsolete old equipment. New instruments are constantly being invented and old ones perfected. On the other hand new equipment may be unsuited for the military service because of difficulties of manufacture in large numbers. This question can best be settled by the manufacturer himself and the Medical Department plan for a definite liaison with industry makes provision for this consideration by the manufacturer.

Moreover, the Surgeon General has on a number of occasions invited medical officers to make suggestions as to new items that should appear on the supply table, or modification of old ones.

It is well to call attention here to the difference between a request for a special article for one hospital or one officer in lieu of a similar standard article) and a suggestion that the item requested is a more modern and more satisfactory article for all hospitals and all medical officers and should therefore *replace* the like article on the standard list.

Specifications.—It should be a cardinal principle that, so far as military necessity permits, specifications should be such as are commonly accepted in civil life and that sufficient contact should be maintained with the allied industries to enable changes to be made from time to time to meet the changes in civil life. Thus full advantage may be taken of America's preeminence in mass production. There are, of course, a considerable number of items devised solely for military purposes. Unless there be some very important reason therefor, a type once decided upon should not be changed in the midst of an emergency. To change a horse in the middle of a stream is notoriously fraught with danger. This does not mean that an improvement is barred, but it should be selected after full consideration of the production difficulties and after assurance has been had that sufficient supplies are on hand to meet the needs until such time as the improved item can be produced and delivered. A change that appears minor may throw the entire mechanism out of gear and may make useless many other articles which have been devised with a view to fitting the article thrown out.

Economy.—It can be stated as a principle that economy in supplies cannot be enforced at a depot desk nor, may I add, at the corps surgeon's or Surgeon General's Office. Any systematic cutting of requisitions will only result in larger requisitions and more frequent ones. There is no question as to the necessity of economy, particularly at the present time. The need therefor is world-wide. We are too apt to think that our country's resources are inexhaustible. It is not generally realized how greatly the resources of even our wealthy country were strained in the World War and how increasingly difficult the continuation of the war would have become. Only the Treasury officials probably realize it in full. It must be remembered that in the end financial resources are the deciding weapon.

The obligation to economy rests squarely upon the shoulders of

medical officers using the supplies, and that responsibility cannot be dodged. It is probable that no heed is given to how important little wastes may become. The prescription of a dozen Aspirin tablets where two or three are required is a small matter in itself, but multiplied by 700 or 800 officers and by the number or prescriptions it does assume importance.

It must be remembered that by economy is not meant alone economy of money. It is true that this may become of importance. Although we Americans are apt to consider our resources as inexhaustible, modern wars are of such magnitude and such length that they strain the financial resources of even the strongest nation. But it is economy of time, of effort, of storage facilities and of transportation that is of importance and the farther from the base of supplies our using organization is the more important does this become. It is illustrated clearly by the difficulties of the A. E. F. Ship tonnage became the all-important factor. A yard of gauze delivered in France and, particularly, delivered at its final destination was of much greater value than its cost in money. The difficulties of its replacement were the measure of its value. An expeditionary force operating beyond a wide expanse of waste land or desert, dependent upon automobile or wagon transportation, would have difficulties in supply, and it is apparent that conservation of material would be an important factor in its success.

While it is true that the Medical Department is considered one of the supply services, it is probable that within the department itself the supply functions are considered as a secondary affair. The tactical functions of the department are of such importance that they receive more attention.

However, it is being recognized that the skill of our regular medical officers, the skill of that great body of civilian physicians who have enrolled themselves in the Reserve Corps, would be of little avail did they have to depend upon their knowledge alone and were they deprived of the remedial and diagnostic agents to which modern medicine is accustomed. It is in recognition of that fact that the Surgeon General has planned to develop in the Sanitary Reserve Corps a group for procurement duty, composed of the executives concerned with the production of medical supplies. It is a recognition of the services of these men in the late war and an acknowledgment that without their assistance the program of the Medical Department would be difficult. This program is an effort to knit into an homogeneous whole the functions of the

Medical Department in order that side by side with the calling into the service of the professional men would go the production of the supplies needed by them.

STORAGE AND ISSUE

Warehousing.—The storage of supplies is usually done by commodity. Economical storing results from experience and involves consideration of access to each item, of aisle space adequate for free movement and for the necessary handling of packages, and of full use of all space.

The Medical Department must be prepared to open new units on the first day of an emergency. It met this need for many years by holding in storage a certain number of assembled units such as field and evacuation hospitals, and it was these assembled units that saved the situation in the early days of the late war. Shall such units be assembled as such in our depots, or shall the storage of the component parts be by commodity in the general stock, reliance then to be upon shipping tickets prepared beforehand?

Whichever method is to be followed there should be and there must be in the second method a uniform method of packing each box. Each package of the unit should be interchangeable with the same numbered box of similar units. Each package may then be stored with other similar packages as a commodity. Without such method of packing, storage of these units must be as an assembled unit because of the time element.

Issue Room.—The issue room is the heart of a depot. Upon its arrangement depends the speed with which the depot can function. A satisfactory arrangement is shown in Fig. 1. There is a limit to the size of an issue room and, once that limit has been reached, a new issue room, entirely distinct and separate, is required. It matters not then whether the new issue room be established in connection with the existing depot or whether an entirely new depot be established. Since often transportation is saved thus, the establishment of a new depot has many advantages.

Statistical Section.—The purpose of the Statistical Section is to have available at all times information as to—

1. Total stocks.
2. Stocks in each depot.
3. Rate of consumption per unit of troops.
4. Rate of consumption per cent of surgical cases in hospital.
5. Rate of consumption per cent of sickness.

Upon these factors can be based the procurement program of the Division and its storage and distribution problem.

The Statistical Section also should be in a position to furnish

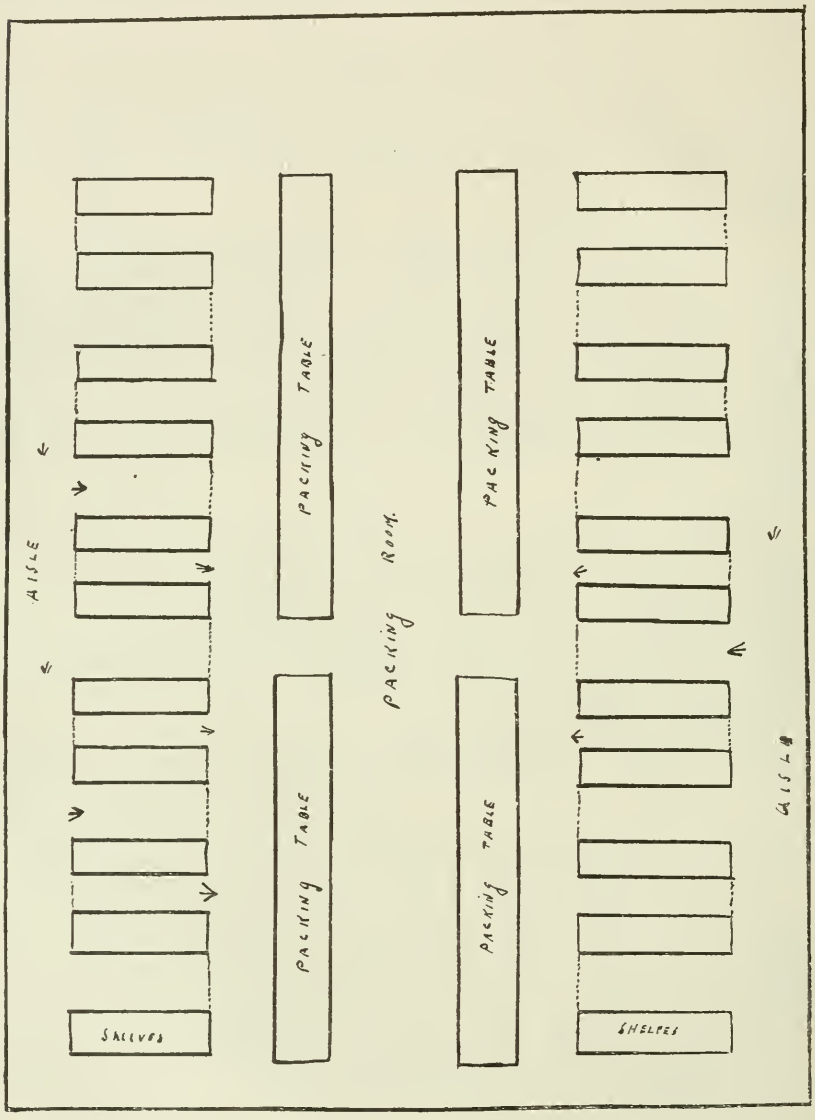


FIG. 1

data as to the cost of maintenance of the Medical Department as a whole, or of each individual institution thereof.

Distribution.—The problems of the Medical Department differ

in many ways from those of other supply departments, and it is often diffcult to secure an exemption from conformity to the general plan of supply depots. All depots are established in echelon. To that the Medical Department adheres.

The volume of the supplies issued by the Medical Department is comparatively small, and as the front is approached the amount to any one organization is very little indeed. The importance of that little, however, may be exceedingly great and rapidity of delivery vital.

With large uniform delivery such as rations or munitions the regular shipment at established intervals to all intents and purposes constitutes the establishment of a number of depots between the issuing depot and the troops to be served. With many articles of medical supply such automatic issue is not feasible and much of the supply of the Medical Department is, and must necessarily be in the nature of the service rendered, emergency. This necessitates either large fully stocked depots close to the troops to be served or the availability of some system of rapid transportation and incidentally direct connection between the requisitioner and the depot.

There is no doubt of the advantage of the establishment of our large depots in direct association with the depots of other departments, but in addition thereto we must have smaller depots nearer the front and must have also truck transportation.

The distribution of stock to the various depots is a matter requiring considerable thought. It is not possible to take the total supplies needed by the field force as a whole and subdivide and distribute them in proportion to the number of troops served by each depot. Consideration must be given to the character of the service performed by those troops and to the conditions under which they are serving.

It is obvious that a larger proportion of splints, field dressings and narcotics will be needed at the front depots than in those of the rear. And conversely, that there will be many things that will be needed in less amounts or not at all at the front.

Many of our supplies are so small that the shipment of original cases to all depots is not feasible. That necessitates the shipment of mixed boxes. These mixed boxes must be unpacked in some central depot and reshipment therefrom of the contents made. Particularly is this the case in the early days of any mobilization when supplies are short. Frequently this will result in back ship-

ments, but it is the only solution since the depot to which these mixed boxes are sent must be centrally located.

Supply Inspectors.—In view of the fact that in time of a major emergency the majority of the medical men using medical supplies are from civil life, with no great amount of training in those duties of a medical officer not professional, it is thought desirable that in such an emergency there should be a group of men whose function it would be to instruct the personnel of newly established medical units not only as to the depots from which they would obtain their supplies, but as to the methods of requisitioning and in the proper care of it and as to the necessity of standardization and economy.

It should be a part of their function as well to assure themselves of the adequacy of the equipment and stock and to suggest additional or improved equipment available or substitute articles that would fit a need.

It is believed that these men would be of great assistance and their service would result in a great economy, particularly in the early days of an emergency when procurement is difficult.

As to whether such services would be of any value in peace depends upon the consideration given to supplies by the regular medical officer.

Finance.—The finances of the Medical Department are subject to the limitations which the Congress may place upon departmental action and also to the interpretations of the accounting officers. Funds are appropriated for certain definite purposes and are not available for any other, however desirable they may be. This should be taken into consideration when any disapproval has been received, and a certain familiarity with the general purposes of the appropriations is not without its advantages. The insistence by the Finance Branch upon certain technical points, such as identity of signature with the creditor's name, is based upon legal decisions and there is no choice in the matter. The more important funds which the Medical Department controls are "Medical and Hospital Department" (M & HD), "Replacing Medical Supplies" (R.M.S.) and the Hospital Fund.

Purchases from the Hospital Fund.—It should be accepted that any item of supply needed by an organization for the care of the sick should be supplied by funds appropriated by the Congress for the purpose. If it cannot be purchased legally from these funds it is not needed for that purpose. If the item is to be supplied, it should be from available stock or by purchase.

If proper requisition therefor has been submitted and the item has been by proper authority denied, loyalty requires that that decision be accepted. If a mistake has been made, there is always the right to appeal. In my judgment, if purchases are made from private funds or from the Hospital Fund for supplies needed for the care of the sick, someone is seriously at fault—either the requisitioner for failure to make proper requisition for his needs or the supply department for failure to function—and in my judgment also in the latter case the proper procedure is to make representation of the facts concerning the supply service to the superior of the supply service.

Emergency Purchases.—Under no condition does this procedure require that the equipment actually required for the sick be withheld. Under Army Regulations, the local surgeon has the right to make such emergency purchases. If he is justified, no one will dare say him nay. However, if the necessity has arisen through his own failure or neglect, he may have to explain such conduct. But even then he should do it and be man enough to "stand the gaff."

What shall be procured, stored and issued by the Medical Department?

From time to time the Secretary of War publishes tables showing the articles that are to be stored and issued by each department. There is a wide divergence of opinion among army officers as to the principles on which those articles should be selected. Prior to the World War each branch procured, stored and issued the supplies that it used. It should not be assumed that that system had grown up without some fairly good reasons therefor. In the midst of the war it was determined that the procurement of supplies should be centralized. This was primarily to ensure that raw materials would not be wasted in unnecessary production and to prevent services bidding against each other. Probably as a result of civilian influence, storage and issue were consolidated as well as procurement. Since the war the pendulum has swung back. Each service is authorized to store and issue most of the supplies that it uses, and the tendency is to permit each service to buy. There is much to be said on each side. It is unquestioned that some controlling agency must exist for procurement in time of war when the raw material resources are strained to the limit. Whether such control shall be control of the finished product and actual centralized purchasing shall be done or whether the control

may be effectively maintained by a control of raw materials and by fixed prices is the question. A great central procuring agency appears, on its face, attractive, but in actual practice it has certain drawbacks. There is a point beyond which it no longer serves the purpose for which it was intended. It is not even certain that a single procuring office would obtain a lower price than the average of several competing ones.

But procurement and storage and issue are distinct and separate. Even though procurement be centralized, it does not necessarily follow that storage and issue should also be.

In other words, shall the distribution be by commodity or shall it be by using organization? It is questionable whether all the economy is on the side of storage by commodity, and it is still less certain that efficiency is. It is futile to go into this subject too deeply here, but it is one worthy of considerable thought.

Will hospitals be more efficiently supplied if they obtain all the supplies necessary for the care of the sick from one depot than if they obtain their medicine, surgical instruments, gauze, technical laboratory equipment, etc., from one and their beds, linen, soap, brooms, mops, stationery, kitchen and mess equipment from another? Have we enough hospitals, and is their importance great enough to warrant a supply service of their own?

Under the Act of June 4, 1920, the Assistant Secretary of War is charged with matters dealing with procurement. His office coordinates the purchases of the seven bureaus.

By a system of allocation of manufacturing facilities and by his control of raw material he controls absolutely the various departments and prevents competition between bureaus or interference one with the other, even though the same article were to be purchased by two or more bureaus. With such a system it appears to me that the bureau charged with the responsibility for the sick might well be given the authority to obtain the supplies essential to that duty.

The ideal supply situation is undoubtedly that which permits requisitions to be approved and issued in full without modification. There is no question that such a situation would please very greatly the supply men. That situation presupposes that the requisition calls only for such things as the medical officer really needs and in such amounts as can reasonably be used. And that is the situation which ought to exist. No one is more competent than the medical officer to determine what and how much he wants, pro-

vided he will give the matter some attention. That is the situation it is hoped will result from a more complete understanding of supplies upon the part of medical officers.

There are two ways of looking at the matter of Medical Department supplies:

1. That all medical officers have an equal concern in supplies and in the economical administration of the Medical Department (and let it be said here that more and more in the future the efficiency of the Medical Department will be judged by the cost of its service as compared to like service in other services or in civil institutions), that upon all alike rests the responsibility for such administration; or

2. That supplies are the concern of a comparatively small number of medical officers on duty in that division, and that all the others need not concern themselves therewith; that all measures for economy are to be instituted and maintained by those few supply officers.

The first method is without question the only feasible one.

If a requisition is thoroughly considered and carefully prepared, so prepared that one's request for a nonstandard type carries with it the explanation of why the standard type will not meet the need, the medical officer ought to be willing to fight, and fight hard, for his requirements. And under such conditions he would be a formidable opponent for anyone who had the courage to cut his requisitions.

Store Rooms.—There is nothing particularly difficult about the proper arrangement of store rooms. It is simply a matter of good housekeeping. They should be neat, clean and so arranged that access can be readily had to any part of the stock for purposes of issue or count. There should be a simple form of stock card and its form is immaterial. When issues are made immediate entry should be made thereon so that at all times there is available a record of the balance remaining. This information is necessary not only for the purposes of preparing requisitions but as well for the purposes of knowing what remedial agencies are available for the treatment of the sick and for the ensuring of the presence of an adequate supply of the necessary agencies. The lack of such a store room is a frequent cause of unsatisfactory and ill-balanced requisitions.

A small stock well arranged more adequately covers the needs than a large stock poorly kept, for in the latter case much of it is not available because its existence is not known.

In conformity with the practice in depots, the supplies should be grouped according to the classes of the supply table and within each class arranged alphabetically.

Requisitions.—The essential feature of a requisition is the statement of the requisitioner's need. There are certain forms for this purpose prepared not alone for the convenience of the depot but as well for that of the requisitioner, since they follow the nomenclature of the supply table which presumably he is consulting in making his selection of the articles needed, or with which he is already familiar. The advantage of some prescribed form in the administration of the issuing depot is obvious, and its only advantage and purpose is not that it lightens the work there but it makes possible a system of accounting that is essential if the depot is to know the amount on hand, which information is necessary to the satisfactory supply of the troops.

However, neither the submission of the prescribed forms nor the alphabetical arrangement of the items thereon is the essential factor. The clear indications of the article desired and the amount thereof is.

Amount Consumed.—The column on the present requisition blank headed "Amount consumed" is intended to serve a very useful purpose. But, unless the figures stated are a true statement of the amounts used, they would better be eliminated. The column should furnish data upon which the central office bases its estimate of quantities required and funds needed. It should also serve the purpose of informing the requisitioner of the proper amount to ask for and should serve as a clue to excesses in issue.

The amount on hand plus the amount received should always equal the amount on hand and the amount consumed reported on the next requisition.

The ideal arrangement for the supply of troops undoubtedly is to have requisitions go direct to the issuing depots and have them issued in full exactly as received except for the necessary protection of the stock, have them when when filled go to some central office for such check as might be desired and for the use of whatever cost accounting system may be in effect. This system would presuppose that the officer making the requisition was entirely responsible for the economical administration of his organization and that he would be held accountable for any failure to so administer it. It is true that with an inefficient officer correction instead of prevention would be necessary, that perhaps often considerable

damage would be done, but it is believed that responsibility makes the man and that the very fact that full responsibility was placed upon the requisitioner would result in more careful requisitioning. If it did not, certainly the matter of correction is a perfectly feasible measure, particularly if it were made a matter of policy to hold such an officer financially responsible not only for any excess use of supplies, but as well for any unnecessary freight charges.

This method would leave the central office free to maintain a cost accounting system which is highly desirable.

It would be a comparatively simple matter to calculate the per capita cost of the posts and stations under similar conditions and the assumption that any post which under similar conditions and extending over a long period of time exceeded the average needed investigation would be warranted. I fully believe that in the end such a system would be more economical than one in which reliance is placed upon the judgment of a few men to prevent over-issues or useless shipments. Control of non-standard articles could still be maintained by the publication from time to time of certain guiding principles.

Red Cross.—The question of the relation which civilian relief organizations should bear to the Supply Division of the Medical Department is a big one. It is not intended to go into that matter in detail. Such relief organizations have developed many functions of great value entirely apart from their supply function which are of course entirely outside the purview of this article. It seems to me that so far as the distribution by them of medical supplies is concerned, it should be confined to where and if the Supply Department of the Army fails to adequately provide. They can be prepared to step in, in a great emergency, to assist in an otherwise insurmountable task (in which case they can assume a part of it or help by contributions from their stocks) or they can be prepared to meet any minor need if the Medical Department is prevented from so doing by inefficiency or fortunes of war.

There is no more need now for the Red Cross to parallel our line of supply than there is for the Retail Grocers' Association to parallel that of the Quartermaster on rations. To do so only duplicates personnel and equipment, both of which are badly needed for the duties of the Supply Division, and complicates the problem of the established supply department.

It is not the function of these civilian relief organizations, not the purpose for which their money was obtained. I am certain

that I am reflecting the opinion of their own leaders in this. In war they have no more money than the Government, and, after all, their money comes from the same source.

I am fully aware of the valuable service rendered by these organizations during the World War and am perfectly willing to testify to the value of such services. I am not decrying them, but am only anxious that the effort of these relief organizations will be released for such services as are more needed and for which there is no established organization within the military establishment. I am likewise desirous that the Supply Service of the Medical Department be relieved from any intimation of inefficiency that is carried with the duplication of system. There may have been such in the days before the Surgeon General was given the responsibility and the authority to provide adequately for the care of the sick and wounded.

There probably never will be again unless he is shorn of the authority which must go with such responsibility. Certainly these relief organizations should be relieved from the burden (for it is a burden) of furnishing supplies resulting from calls made by medical officers through ignorance of supplies available from Army sources or through unwillingness or inability to take the necessary steps to obtain them. If it is any more difficult to obtain them such changes in the personnel of the supply service as may be necessary should be made.

TWO CALCULATING CHARTS[1]

By CYRUS B. WOOD, B. S., M. D., M. S.
Major, Medical Corps, U. S. A.

(With two charts)

THE accompanying charts will be found useful in obtaining quickly approximate answers to simple calculations involved in (chart I) the

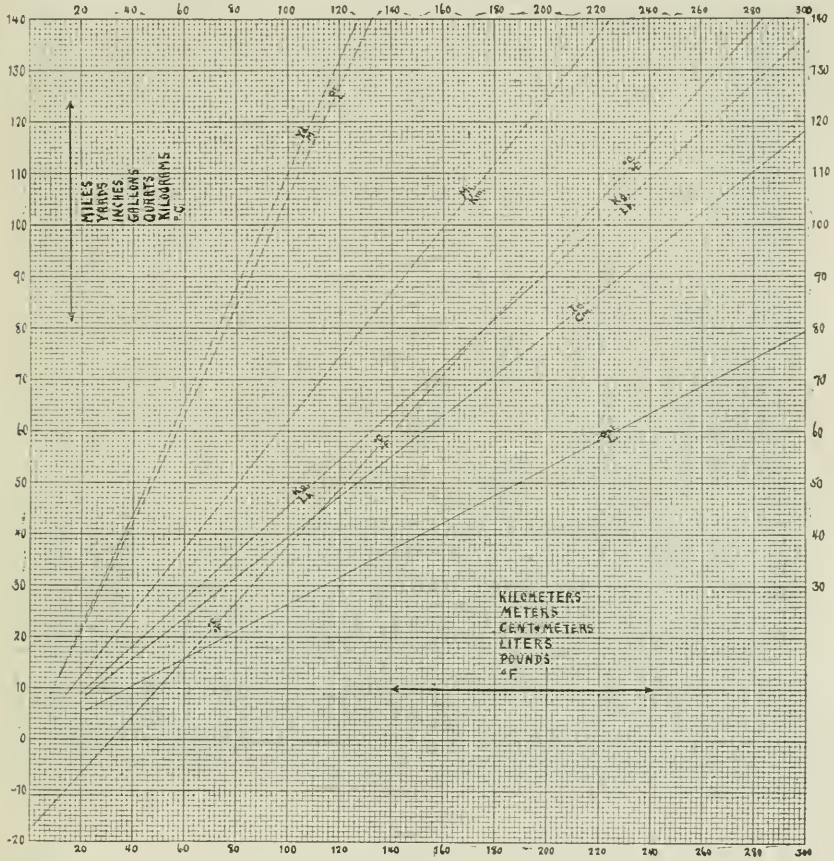


CHART I

conversion of several ordinary units into metric system units and (chart II) certain volumetric analytical problems.

The results are accurate only to the smallest divisions of the charts.

[1]From the Division of Laboratories, Army Medical School. Published by permission of the Surgeon General.

It is not claimed that they can replace results obtained by using accurate equivalents or accurate atomic and molecular weights, but they are sufficiently accurate for many purposes, and serve to save the time required to look up metric system equivalents and atomic and molecular weights.

Chart I converts several units of length, weight, volume and temperature from ordinary scale into metric system units, and vice versa.

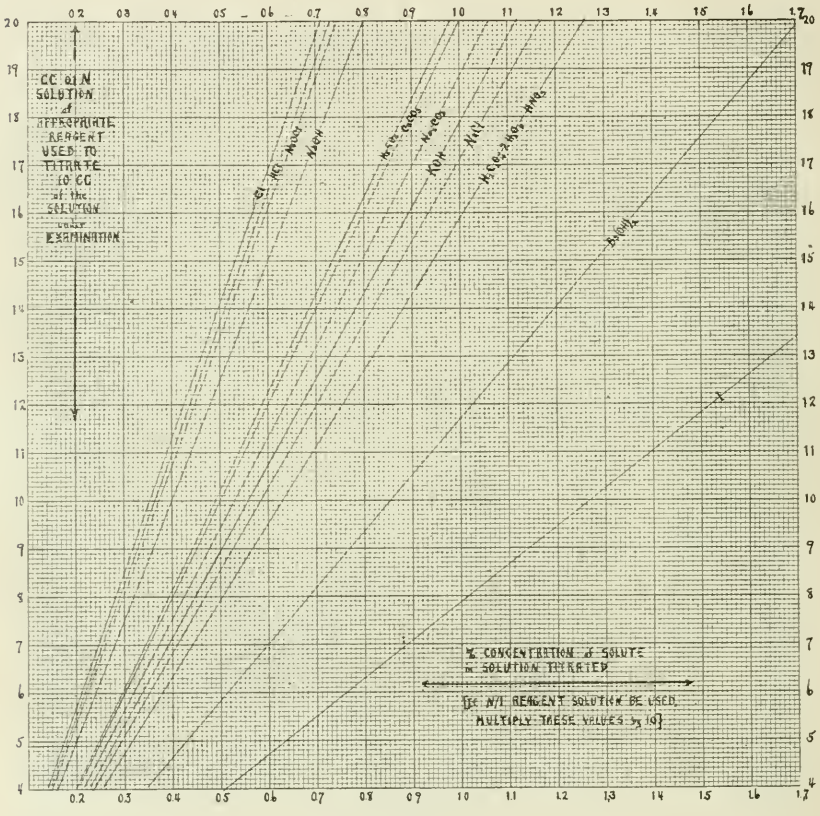

CC of N SOLUTION of APPROPRIATE REAGENT USED TO TITRATE 10 CC of the SOLUTION under EXAMINATION
% CONCENTRATION of SOLUTE in SOLUTION TITRATED
If N/1 REAGENT SOLUTION BE USED, MULTIPLY THESE VALUES by 10

CHART II

By using a chart scale half as great horizontally as vertically it is possible to draw in a square area several curves of sufficient length to include in each case a considerable range. It will be noticed that with two exceptions the units read on the abscissa are in the metric system; a chart having all the metric system units on the abscissa would have been more striking, but the two curves in question would have been considerably restricted in range had this been done.

Two methods may be used for obtaining more accurate results. First, a large chart may be drawn, 18 inches square or larger; when this is done, care is necessary in obtaining an accurately ruled paper. Second, a factor can be obtained from this chart and used arithmetically, e.g., to convert miles into kilometers: the chart shows that 100 miles equal 161 kilometers; 1 mile therefore equals 1.61 kilometers. Conversely, 100 kilometers equal 62 miles; 1 kilometer equals 0.62 mile.

Chart II simplifies the calculations in the analysis volumetrically of dilute solutions of several compounds, for each of which a curve is given. It is based upon the use of 0.1 *N* solutions of the appropriate reagents, since this concentration is the most widely used. The chart includes the range between 0.04 *N* and 0.2 *N*. If the solution under examination is sufficiently concentrated to warrant the use of a solution of reagent of *N* concentration, use the chart as follows: read as though 0.1 *N* reagent solution had been used, then multiply the result by 10.

OBSERVATIONS ON THE USE OF A STEAM JET FOR DELOUSING RAILWAY COACHES

By Major LAWRENCE H. DUNN, Ovid, N. Y.
Sanitary Reserve Corps, United States Army

DURING the period between 1914, when the World War began, and 1920, when the fighting ceased in Russia and surrounding countries, lice infestation was very prevalent among the military and civilian population of Europe and typhus fever took heavy toll in several of the countries. This situation created considerable interest in these parasites, and many observations were made on their life history, dissemination and methods for their control under various conditions.

One of the important phases of this work was the disinfesting of railway coaches, especially in the countries where epidemics of typhus and relapsing fevers prevailed, and where, owing to a shortage of railway equipment, the number of trains that remained in operation was greatly reduced and these always overcrowded. Various methods were tried out in connection with this work in the several European countries. These varied from the ordinary sweeping, scrubbing and brushing of the coaches to the large iron cylinders into which coaches could be placed and then exposed to steam or hot air, which were reported as having been used in some sections of Germany during the war. It is quite probable that the results obtained in this work were as variable as the methods used.

In April, 1920, the writer, while engaged in anti-typhus work at Vilna (Wilno), Lithuania, was afforded an opportunity for making a few observations on the use of a steam jet for delousing railway coaches.

A large steam tractor, of the type used by the American Army in France in connection with the American mobile laundries, supplied the steam necessary for this work. A roadway made of railway ties ran parallel with the railroad track for about 100 feet or more, upon which the tractor moved forward or back when necessary. A steam pressure of approximately 125 pounds was maintained in the boiler of this tractor. A flexible steam hose about 30 feet in length, and having an iron nozzle at one end, was attached to the boiler. The steam, when turned on, passed through this hose and issued from the nozzle in the form of a jet with considerable pressure. A valve set in the coupling that connected the

hose with the boiler somewhat reduced the pressure of the steam as it passed from the boiler. There was no gauge affixed to register the pressure of the steam as it passed through the hose, but it was estimated as being about 75 pounds.

Coaches to be deloused were placed on the railroad track parallel with the roadway on which the tractor operated. The nozzle end of the hose was then taken into the compartments and all parts of the interior swept with the jet of steam.

Thermometer tests to determine the temperature and experiments to ascertain the lethal effects of this jet of steam when applied to lice, were carried out, two types of nozzles being used.

Narrow nozzle.—This nozzle was flattened horizontally, allowing the steam to emerge as a narrow jet about 2 inches in width. Thermometer tests with this nozzle gave the following results:

Distance from nozzle	*Length of exposure*	*Temperature obtained*
12 inches	30 seconds	134° F.
12 inches	15 seconds	136° F.
6 inches	30 seconds	144° F.
6 inches	15 seconds	138° F.
1 inch	1 minute	178° F.
1 inch	15 seconds	164° F.
1 inch	1 second[1]	134° F.

It is quite possible that the actual temperature at approximately one second's exposure was somewhat higher than shown in the above table, as one second is a very short period for a thermometer to register accurately.

Lice that were exposed to the steam at 2 feet from the nozzle for 30 seconds remained alive and were apparently but little affected. When exposed at a distance of 1 foot for 30 seconds about 25 per cent were killed.

When the nozzle was placed close to a wall and the steam applied, a thermometer at the side of the jet and about 2 inches distant showed that the temperature obtained after 10 seconds' exposure was 142° F., while at 3 inches it was 129° F.

Wide nozzle.—This nozzle consisted of a T-shaped iron pipe with narrow slits cut in the cross piece, which was about 12 inches long, allowing the steam to escape in narrow jets throughout this length. Lice were used in tests with this nozzle and the following results were obtained:

[1]Approximately.

Distance from nozzle	*Length of exposure*	*Results*
6 inches	5 seconds	Alive
3 inches	5 seconds	Dead
1 inch	5 seconds	Dead
1 inch[2]	1 second	Dead

Body lice were confined in small chiffon sacks and placed beneath the plush covering of the seats through a rent in the cloth. The steam was then passed slowly over the plush at this place with negative results. This test was repeated several times with different lots of lice, but the results were the same.

Thermometer tests with this wide nozzle gave approximately the same temperatures as the narrow one.

It is rather difficult to draw very definite conclusions regarding the efficiency of this method of delousing coaches as so much depends on the individual manipulating the nozzle and the thoroughness with which the steam is applied to all parts of the seats, walls, ceilings, floors, etc. The experiments prove that lethal effects are obtained when lice are exposed to the steam jet at approximately 1 inch from the nozzle. It is also quite evident that the steam applied with pressure is a great deal more destructive to lice than moist heat of the same temperature without pressure would be. However, it is not effective if required to destroy lice that have crawled through rents in the upholstery of the seats and are protected by the cloth covering. The small radius in which an effective temperature is obtained at either side of the jet indicates that, in order to secure the best results, it should be passed very slowly over every area 4 inches square of the interior of the coach with the nozzle held at about 1 inch distant from the surface to be disinfested. This would require a considerable amount of time for each coach, even if the wide nozzle be used, and the difficulty in maintaining a high pressure of steam in a boiler while so much of it is being used in each coach is quite apparent. It is the opinion of the writer that this method is not practical for delousing coaches, at least in any great numbers.

[2]This test was repeated three times with positive results each time.

EXAMINATION OF THE PATIENT [1]

By Major T. E. SCOTT
Medical Corps, United States Army

THE SUBJECT matter presented here may seem very trite. Its importance, however, is so essential that constant reiteration is not amiss. Fully 95 per cent of all human ills can be diagnosed and properly treated by our ordinary clinical senses and with no more technical appliances than a stethoscope and a fever thermometer. It is not my intention to decry the use of such valuable aids as the clinical laboratory, X-rays, diagnostic tubes and other such appliances. They have their proper sphere in aiding the clinician, but it is extremely rare indeed that they can do more than offer confirmatory help. Pulmonary tuberculosis so frequently diagnosed by the X-ray is not possible of diagnosis by such until changes have taken place in the lungs sufficient to obstruct rays. In other words the X-ray shows results of rather long-standing trouble. A careful history with physical findings will usually establish a fairly correct diagnosis months before there are X-ray changes or positive sputum. In chronic gastrointestinal diseases the X-ray evidence is so late in establishing itself as to be of comparatively slight value in the incipiency of disease. In the frank, well-established ulcer it will give valuable diagnostic help in an extremely high per cent of cases, but unless the symptoms and history are in accord we are never quite certain even then. In carcinoma, by the time filling defects are present the tumor has reached a hopeless stage with a train of symptoms dating back a year or more. Even in X-ray work the roentgenologist must know the entire history and clinical findings to be able to give his best interpretations on findings *so often extremely indefinite*. It is necessary, therefore, to use every means at our command, but for the present at least a careful history with thorough examination must remain our chief dependence for early diagnosis and treatment. The exceptions will form less than 5 per cent. Take a case of typhoid fever now in the hospital, for example. The patient was entering the third week of the disease before bacteriological proof of its existence could be given. He was properly diagnosed *clinically* after a fifteen-minute examination, and treatment instituted at once.

During my early career as a physician my practice was in the

[1] Read before medical officers of El Paso District, March 11, 1923.

lowlands of Mississippi where malaria was the chief ailment. I had a microscope and adopted modern methods, but depended entirely on the blood findings to diagnose malaria, and lost many cases by reason of such. The good old country doctors who never owned or used a microscope would make a proper diagnosis, start treatment, and be at home while I fussed over my stains. It was there I learned that the plasmodium is not always found in perfectly frank malaria, also that one had to diagnose and treat these severe pernicious forms at once or lose the patient.

The time taken to record a complete history and examine a case properly is not very great if a definite routine is followed. Such routine has the advantage of giving a complete survey of the patient and often discovers disease far remote from the one complained of, as is so frequently shown in active tuberculous cases who also have active gonorrhea. I find myself frequently embarrassed by just such situations because of being in too big a hurry to properly examine the patient. In one instance I recommended for transfer to Hot Springs, Ark., a case of supposed rheumatism of the right shoulder joint, which was actually an amebic abscess of the liver. A few such instances as this will convince us of the necessity for a careful routine, religiously adhered to in every single case, regardless of its nature. I would like to make the assertion, without fear of successful contradiction, that failure to diagnose a case is almost always due to neglect in carrying out an orderly routine and spending insufficient time with the patient rather than to inferior ability on the part of the examiner. Hard work, coupled with common sense and an average knowledge of medicine, is the keynote of diagnostic success.

One should take notes on every case he treats. It will make him study his cases more carefully and also furnishes a comparative study of disease not obtainable from books. Read the story of Sir James MacKenzie if you feel that your time is too precious to do this. While doing a busy general practice in a country community he found time to record an accurate history, physical examination, and the results of treatment in almost every case. He furthermore obtained, in permanent form, polygraphic tracings of every case showing any heart disturbance and thousands of normals. Today he is one of the leading authorities on heart diseases. There is, therefore, no end to our accomplishment if we would only utilize the time we have at hand each day.

There are often situations, it is true, when we must handle cases

very expeditiously—quantity production as it were—as in the case of epidemics, the daily sick call, and in special surveys of troops. I will try, however, to show later how this may be done without *completely* sacrificing an orderly routine calculated to reduce our mistakes to the minimum. The following outline of history and physical examination is especially suited to hospital cases but can be moulded to fit any situation if it is fixed in your mind well enough to *become usable.* I would suggest that, whatever routine one adopts, he should write it down first and follow such outline until its steps become automatic. By so doing, it is not long until one can go through every essential detail in a very short time indeed—about twenty to thirty minutes for hospital purposes and proportionately shorter or longer as the situation demands. Very frequently it becomes necessary to enlarge on some special examination such as the chest, when you discover some sign or symptom indicating possible tuberculosis. This will, of course, require time to do thoroughly. A mental examination alone requires much time to record every factor entering into a diagnosis of mental disease. It is not intended, therefore, to carry you afield into every specialty, even if I were capable, but to present a method of classification and diagnosis of the vast majority of diseases and to lead you in the proper direction for more thorough study of the others. It is manifestly impracticable, even in the best hospitals, to carry a patient through every possible examination and study. Obviously one would not make pyelograms, do spinal punctures, or take gastrointestinal X-ray series, as a routine measure. *There should be some definite indication for such in each case,* shown by your routine examination. It therefore becomes a big factor in *ruling out and excluding* those things not required to be done. The habit of ordering every conceivable special procedure on a patient, just to be sure "nothing is overlooked," is a lazy man's method of seeming industry, serves no good purpose, and should be condemned. A physician should be prepared to show the necessity for each procedure he recommends.

It so happens that in our work in the Army we must adopt methods calculated to handle large bodies of men in short periods and frequently are compelled to consider averages. For example, take the method of examination for tuberculosis adopted in the Army during the war. The actual time necessary to completely examine a tuberculous patient under hospital conditions and to record the findings will average something like twenty to forty

minutes, yet Colonel Bushnell and Major Bruns developed a rapid method whereby they could examine troops in line in three minutes and established the high efficiency of about 97 per cent of correct diagnoses as to the existence or nonexistence of the disease. All cases taken out of line by such method were later gone over more carefully and the diagnosis confirmed. Certainly they must have failed to discover many cases, but the per cent was very low. They adopted what seemed the best method of securing the highest average of correct diagnoses in a difficult situation, and the result of their work alone stands out as a remarkable achievement in medical history.

The "sick call," requiring, as it does, quick decisions with slight information, will demand some system of sorting the sick from the well. It is not a place for complete diagnosis and treatment except for trivial cases, yet the number of correct diagnoses made is often very high. If the patients' temperatures are taken before they reach the doctor (i. e., by an orderly or sergeant) and each one is partly or wholly undressed, I believe that the average medical officer can dispose of his cases in two or three minutes average time. Many cases, such as injuries, will be obvious and require only an instant to stand aside; others require more. A short history showing the complaint and immediate cause, with a quick examination of the throat, lungs, heart, and abdomen, can be made in five minutes. When the patient is found to have something requiring further study, this can be made immediately after sick call or at some other suitable time. Those going to hospital can be looked over more thoroughly after the line has gone through and rarely require more than a few minutes in which to make a tentative diagnosis. An extremely large number of cases do not actually need to go on sick report, yet receive frequent treatments. These cases present chances for thorough and complete study by the regimental surgeon, when he can go over them more at leisure. In other words, here, as elsewhere, one must adapt himself to the situation, attempting to attain the highest average, and doing the most complete work possible under the circumstances.

It is not intended that this outline shall be considered as hidebound in the least. Only salient points can be mentioned to indicate a method of procedure. No outline can be applied literally to all cases and as a general proposition printed history forms are bad.

HISTORY

Name. Age. Martial State. Length of Service, etc., on 55–A.
Occupation: (1) Laborer, gives a clue to mental equipment, physical endurance, exposure.

(2) Clerk, may reveal effort syndrome or other developmental physical defect. (The law of selective employment applies.)

(3) Farmer-boy, probably has not had all the acute infectious diseases. More likely to be sufferer of hookworm, malaria and dysenteries. Not versed in the serious possibilities of venereal disease.

(4) Cavalry soldier, often asthmatic and anaphylactic to horse serum requiring caution in giving antitoxins.

(5) It is well to inquire into all former occupations and to pay particular attention to *painters, lead workers, miners, wind instrument blowers, glass blowers, and to any occupation* recognized as having a definite bearing or connection with disease. *To state occupation as "a soldier" does not aid materially and is incomplete.*

Tropical Service (Residence).—*This should show a brief of all residence,* before and after entering the Army. Malarious districts, Mexican border service (amebic infections, typhus and Malta fever).

Habits.—Should include other things than alcohol, such as hours of work, eating and sleeping, tobacco, constipation, mode of dress, personal hygiene or any habit which might give a clue to his ailment.

Family History.—There is no "negative" family history. Every man has a mother and father and a statement as to their ages and condition of health is essential. Brothers and sisters must each be described, condition of health, or cause of death in each. If there are many deaths in the family, careful effort should be made to find the cause. Do not take the man's diagnosis without satisfying yourself of its probable accuracy. The condition of the wife's health, miscarriages, and health of children—all are very essential. Inquire especially as to his home conditions if married and the kind of home life during his childhood. These bear directly on whether or not he lives a sanitary and wholesome life. Give special attention to chronic diseases such as diabetes, cancer, tuberculosis, blood diseases.

Previous Personal History.—Not only refers to past diseases but past life. Question carefully regarding all the usual diseases,

such as typhoid, pneumonia, influenza, measles, malaria, diphtheria, rheumatism, tonsillitis, acute colds, cramps, vomiting attacks, dysentary, small pox, scarlet fever, pertussis and influenza *and in each case satisfy yourself that each one claimed is properly diagnosed.* For example, rheumatism may have been simply fleeting pains, malaria may have been guessed at. Repeated "influenza" may be repeated manifestations of an early tuberculosis and improperly called "Flu." It is rare indeed that one cannot secure previous history which will throw light on the present condition. If the patient claims that he was never sick before, make him describe everything he has done, all his various jobs, what medicine he has taken, how regularly he has attended school, work, etc., and you will frequently uncover some pertinent facts.

Gunshot Wounds and Other Casualties.—Here describe all surgical operations and injuries, and enlarge on anything not fully described above. If there has been an appendectomy, find out how many attacks prior to operation, and how long sick. Cholecystectomy points to sérious metabolic disturbances, which demand information as to the state of health before and after such operation. Removal of the gall bladder with stones does not necessarily cure the condition originally causing the stones.

Venereal History.—Question carefully as to eruptions, sore on penis, urethral discharge and satisfy yourself of the existence or nonexistence of such. Do not write "negative."

Present Complaints (Condition on admission sheet).—Ascertain here each and every complaint of the patient and set them down *in numerical order,* such as: *vomiting, loss of appetite, loss of weight, headache, pain in abdomen, bloody urine, etc.* Question him carefully to obtain those he has overlooked or perhaps has not considered of consequence. For example, the patient may be weak, dizzy, dyspnoeic, and extremely anemic and yet not mention a slight soreness of the tongue which is possibly the most pathognomonic symptom in pernicious anemia. Try to elicit the outstanding features only at this point without too much loss of time. Thorough discussion of each complaint should be made in describing onset and course.

Onset and Course.—First, give a short description of the length and general course of the disease and then take up each complaint in order, describing its origin, duration, character, severity, time of occurrence, relation to food, rest and exercise. For example: pain in abdomen should be located, its severity and duration as well as

relation to meals, work, rest, and taking of soda, ascertained. Is it associated with nausea, followed by vomiting or relieved by such? This part of your history will form the main body of the narrative and if well-taken often presents a readable treatise of the condition. There are frequently developed facts unrelated to the actual condition, but their insertion is called for and sometimes serve as leads in obscure ailments. A multiplicity of irrelevant complaints and a voluminous enlargement in describing the onset and course, particularly when much of it fails of orderly analysis, speaks for mental or nervous phenomena instead of actual physical pathology. Skilful questioning often aids in bringing out facts not previously apparent to the patient and helps you build the structure. To do this one must have in mind the various possibilities in the case and quizz accordingly.

Inventory.—At the end of each history an inventory should be made according to the various systems, such as:

Nervous system: no dizziness, no fainting spells, no headaches.
Gastrointestinal system: no vomiting, pain in stomach after eating, no diarrhea, etc.
Cardio-vascular system: palpitation, swelling of feet.
Respiratory system: dyspnoea, cough, bloody sputum.
Genito-urinary system: nocturia.

Mentioning all positive finding and calling attention to the nonexistence of other usual findings, so as to aid in differential diagnosis. At this point you will usually find it necessary to go back and question more closely to ascertain whether or not he has a certain symptom, which you think he should or should not have. It is here that you take a stock of your patient and make an effort to round out the picture. It will show how careful you have been in your history taking. It furthermore serves as a ready reference to your conclusions at this point. In probably 90 per cent of your cases you will have formulated a fairly correct diagnosis at this point which further work will prove or disprove.

The Physical Examination.—You cannot examine a patient thoroughly unless you have proper equipment and have your patient in a comparatively quiet place away from disturbing interruptions. Each physician should have his own stethoscope, of the best make. The ear pieces should fit snugly but not hurt the ear. A small pocket flashlight, a percussion hammer, skin pencil and blood pressure instrument are essential. I furthermore feel that every physician who waits on the sick in hospital should wear a gown. There

are several good reasons for this. It protects his clothes and *is a means of causing him to examine the patient more carefully.* You cannot possibly examine and treat a sick man without coming into close personal contact with him, and you owe it to other patients and to your family not to become a direct carrier of diseases. The appearance of physicians in clean white gowns has a beneficial effect on patients, personnel, and visitors.

I. *General Description of the Patient.*—Note general appearance; is he acutely ill, dull, bright, in apparent pain or distress? What is his apparent age? Is he ambulant, or in bed, quiet or restless? Does he reply intelligently and freely to questions? Is he stupid, ignorant and indifferent? Try to obtain a good estimate of what you see, noting especially obvious abnormalities; such as, cyanosis, distressing dyspnoea, flushed features, puffy eyes, icterus, pallor. In fact practice the art of taking in at a glance every unusual feature.

Now start with the head and proceed in an orderly routine manner to examine every portion and system of your patient.

Head: note any abnormalities. Examine scalp and face, note facial tremors.

Eyes: mention whether or not sclera is clear, yellow, red, or in anyway abnormal. Pupils: reaction to strong light. Mucous membrane: red or pale.

Mouth: condition of mucous membrane, teeth, gums, tongue, throat, and tonsils. Note steadiness and condition of the tongue.

Nose: discharging, pinched, deformed, blue, red, breathing passages open?

Ears: discharging, clean canals, tophi, eczema, tenderness over mastoids?

Neck: adenopathy, thyroid gland, venous pulsation, condition of sternomastoid muscles.

Chest (Lungs): shape, size, expansion, supra-clavicular retraction, prominent ribs, bulging interspaces, Litten's sign. Palpation: not of very much value except where marked conditions present. Percussion: compare notes on both sides, covering whole chest, percussing lightly. Auscultation: breath sounds, whispered voice, moist râles, rhonchi, rubs, clicks, sternal sounds, marginal sounds, describe accurately the physical signs and do not say "normal."

Heart: locate apex beat by inspection and palpation (never overlook this). Percuss out left border, right border, and aortic width, and state the measurements in c.m. in every case. Palpate for thrills at apex and base. Listen carefully for first and second sounds and note sharpness, reduplication, extra systoles and rhythm. State whether or not there are murmurs and if present the kind, i. e., systolic or diastolic.

Do not say "mitral murmur" or "aortic murmur." If diastolic, are they late, early, or mid-diastolic? Describe character and area of transmission. Listen with patient in prone as well as standing position, also with breath held in forced inspiration and expiration. Murmurs due to mitral valve lesions are heard best in prone position, aortic in standing. Note especially the aortic and pulmonic second sounds. Are they sharp? *Which is sharper?* Count the heart rate and set it down to compare later with the pulse rate. The blood pressure should be taken in every case and recorded, using stethoscopic method. Note whether pulse pressure is large or small.

Pulse.—Give rate, rhythm, force, character, comparing both wrists. Look for Corrigan's pulse and capillary pulsations in all suspected aortic lesions. Compare rate with that at apex and *note deficit.* If there seems to be missed beats compare with the waves in jugular veins with patient lying down.

Abdomen.—Describe general appearance, bulging, eruptions, or retractions. Palpate carefully, going over every portion, feeling for the spleen, liver, masses, tenderness, and note each. Light palpation is the only kind which will reveal delicate changes. The abdomen should be percussed, outlining the stomach, confirming the liver and spleen borders, and locating fluids. It is remarkable how much valuable information one can get from physical examination of the abdomen with nothing but his bare hands, coupled with a carefully taken history. I believe it will reveal more information than all laboratory aids combined. The presence of old scars should be noted and recorded and further information as to their causes obtained. The patient should be examined both lying down and standing to note displacement of masses, liver, spleen, kidneys, and pendulous condition of viscera in general.

Genitalia and Anus.—These subjects should have a separate heading and one should mention presence or absence of adenopathy, scars on penis, hernia, signs of active disease and abnormalities of any kind. Eruptions and cleanliness should be noted. The anus should be inspected for ulcers, abrasions, hemorrhoids, signs of irritation from acid evacuations and cleanliness.

Extremities.—These should all be gone over noting eruptions, deformities, clubbed fingers, size and condition of joints, varicose veins, scars from old ulcers, sweating, etc.

Neurological.—Reflexes: start with the plantar, then take ankle, knee, cremasterics, abdominals and deep arm reflexes. If these are

normally brisk the nervous system will usually be intact. Station and gait should be described in ambulant cases.

A description of any special condition, as a generalized eruption, may now be given and ordinarily should complete the average routine examination.

Mental.—The mere performance of the above examinations will usually indicate the presence or absence of any mental disorder. Loss of light reflexes, disturbed knee jerks, and scanning speech with facial tremors suggest paresis. Rhombergism is not positive just because there is swaying. There are few people who do not sway slightly with the eyes closed. Should there be suspicious signs of incoordination other tests should be tried to confirm this. Facial tremors with or without a washing out of the normal wrinkles and lines demand careful investigation. A history showing multiplicity of irrelevant complaints and exaggerated reflexes point to a neurosis. Those who develop queer mannerisms, are stupid, indolent, inattentive, and otherwise abnormal during the examination direct you into the proper channels for further study.

Record all findings clearly and in simple language. Do not try to use brilliant and little known terms. Never describe a sign or symptom by some man's name if you can avoid it. If the knee jerks are absent, *say so,* and not that Westphal's sign is positive. It is better understood. It so happens occasionally that some conditions may be better described by a name like "Romberg's," which is so universally known, but a description of the kind and amount of swaying present serves to add clearness even here. Do not say Graves' disease or Basedow's disease for exophthalmic goiter. There are, I think, a few exceptions to this rule; example: Addison's disease has no other very good name.

When a good history has been written and a thorough physical examination made a diagnosis is practically always apparent. It will be found that most laboratory and special examinations afterwards are confirmatory only. Furthermore, one can more intelligently request the kind of examination which will aid in clearing the diagnosis.

One should make a practice of putting down a tentative diagnosis as soon as the history and examination are completed and immediately below this make a note of the special examinations, such as X-rays, laboratory and consultations, considered necessary to aid him in completing the case. It is good practice, and a failure to make a correct diagnosis will often be of great value in directing his judgment for future work.

Laboratory and Special Study.—It is the nature of things in army work that we must secure many routine laboratory examinations which are not actually called for by the nature of the case. Routine Wassermanns have done more than any other thing in controlling the morbidity from syphilis. Routine urines and blood counts are universal for all hospitals. Routine venereal inspections, routine sanitary inspections and even routine visits by the Inspector General's Department, all have a valuable place in the prevention of disease and putting our medical practice on the highest possible basis. We are, therefore, not doctors solely in the sense of the average civil practitioner, but are, to a degree, specialists in preventive medicine as well. There is, however, a reasonable and happy medium, which we can determine by a careful study of each case, in determining the things necessary to ask for from the laboratory, X-ray, and other aids. I believe we should practice doing everything possible to clear up our case clinically before asking someone else to aid us. If we are located where the endamoeba are present, it is certainly wise to secure stool examinations in all cases remaining in the hospital long enough.

A case coming to hospital and showing albumen and casts in the urine without obvious cause to indicate its secondary nature should ordinary require the following additional study: day and night output of urine, a 2-hour specific gravity test, and a phenolsulphonephthalein excretion. These are simply and easily done and if normal, often end the case at this point. If not, blood chemistry may be asked to show nitrogen and salt retention, and if further study is indicated the output of these articles in the urine, after a measured diet, may be ascertained. This work, however, is highly technical and requires much labor. Consequently they should be asked for only when positively indicated. They are not essential to the diagnosis of nephritis. In pregnancy frequent estimations of the twenty-four-hour output of urea in grams is essential to proper management.

In gastrointestinal cases when we develop a fairly consistent history, showing pain after eating, relieved by foods or soda and with tenderness sharply localized over a point near to the upper and right side of umbilicus we should put the patient on a meat-free diet and after three days have the stools examined for occult blood. This is one of the most significant signs in peptic ulcer. Our next step is to do a careful clinical gastric analysis asking for the content of total acid, free HCl and combined HCl in each tube,

also the presence of lactic acid, blood, mucus and ferments. The diagnostic tube will furnish valuable information other than that secured by chemistry and which we must note ourselves. It will show large gastric retention, free blood, mucus, undigested food from the night sandwich, particles of tissue, the ease or difficulty of swallowing the tube, and many little points regarding the temperament of our patient, all of which aid in diagnosis. The presence of large quantities of gas in the stomach and a history of passing gas by bowel point more to disease of the gall bladder than duodenum or stomach. X-rays of the gastrointestinal tract should never be done until the case has been thoroughly studied by every reasonable means to establish a diagnosis. If the case is worked up in this way so that the clinician and roentgenologist both have a definite object in view, the likelihood of a correct finding is much improved and much needless delay and expense will be saved. If we will only recall how indefinite and inclusive the X-ray evidence is at times and how dependent it is upon the total clinical picture for accurate interpretation, it will aid all concerned. The habit of sending poorly studied cases to the X-ray is inexcusable and should be condemned.

Consultations with other officers should be freely sought in all cases where there is any question of doubt. I sometimes think that we do too much of it. We are all doctors and can all examine chests, abdomens, etc., and if by doing so we discover some condition not understood, then help should be sought. It may be wise sometimes, however, to call in someone even when the condition is understood, for the purpose of moral or other support or to satisfy the patient and protect the medical department. We are all striving to accomplish the same thing—that of handling and treating the sick, and the more team work developed the greater the collective and individual success.

Finally, let me state that no one can lay down inflexible rules or formulae which will tell you how to diagnose and treat disease. It is said that the mark of a good bridge player is to know when to break the rule, and I believe such applies here as well. Just remember that no amount of didactic teaching or study will tell you how to recognize accurately an enlarged spleen or liver, or the difference between systolic and diastolic murmurs. You must seek this information *by first hand study.* One of Forcheimeir's favorite expressions was that "the spleen is not going to tell you it is enlarged and tender." We must put our hands on the patient to

determine this fact, and, furthermore, we must constantly feel normal abdomens if the abnormal is to be recognized. The same principle applies to hearts, lungs, ears, and throats. Look at them, feel of them, and listen to them constantly in an effort to recognize expressions of *actual disease.* Keep in mind normal functions and recognize that if a heart or other organ *is performing that normal function it is not sick, regardless of its size, shape, or previous condition of servitude.* Learn the difference between abnormal signs *that do not mean disease* and *those that do.* Follow your case as long as you can and learn the final outcome, comparing this with your first opinions. In this way only can we really learn medicine.

AN EFFICIENT STATE MILITARY MEDICAL DEPARTMENT [1]

By Colonel JACOB FRANK
Illinois National Guard, Retired

THE Medical Department of the National Guard of the great State of Illinois, and this is equally true of many of the states, has been existing in the past under difficulty. In order to make this department a success it must be placed upon a business basis. The first step in this direction is to have it administered entirely by the Chief Surgeon. This will obviate all confusion and conflict of authority, and will also, in a great measure, lessen the labors of the Adjutant General and simplify the work of his department. At the same time, it will render more effective the work of the Medical Bureau.

The Chief Surgeon must be a man of executive and administrative ability, a capable medical man, sanitarian, and with military experience. He should have full control of all military medical affairs in his state, and all responsibility should center around him for everything pertaining to the Medical Department. A full and complete schedule of the personnel and equipment connected with his department should be in the hands of the Chief Surgeon, and he should at all times keep in close touch with the administrative staff. Moreover, an adequate salary should attach to the office in order that the incumbent may devote his entire time to his department. It is not reasonable or fair to expect efficient public service from a physician dependent upon his private practice for a livelihood. In the Federal service few military surgeons keep up their private professional work, or are able to do so if they desired. They are, however, on a salary which enables them to devote their entire time to their military work. And since the duties of the Chief Surgeon, as imposed by the War Department and the state, are very exacting, it seems, in my judgment, only fair that his office should likewise be placed on an independent footing.

I can urge this point the more freely as I am not speaking with any view to self-interest. It is far from my thoughts to accept a remunerative position from the state in this capacity, but I have in mind the future betterment of the service, and I sincerely desire

[1] This address was written for delivery at the Annual Meeting of The Association of Military Surgeons of the U. S. at Fort Benj. Harrison, Ind., October, 1917, but owing to the fact that Colonel Frank was called away suddenly, it was not delivered.

to lighten the burdens and to render more effective the work of any brother in the profession who may be honored with the position of Chief Surgeon of any state. This man should be not only well versed in the science of medicine and a good soldier, but he must also have administrative ability and a capacity for organizing and systematizing his work. When you have found the man who meets these requirements, you will have a public servant who will more than earn any salary that may attach to his office. I would emphasize this business ability, this skill at evolving system, as of prime importance. To make the point clearer, I might refer to Baker, Daniels, Hoover, Wood, and many others who have been called to public life from various fields of activity and who have brought with them into office this peculiar talent of which I speak—the mastery of detail and the broad viewpoint of the executive.

All commanding officers of the sanitary troops of all the units and various organizations should conduct their business through the Chief Surgeon's office—the proper military channel. Copies of military reports and quarterly drill attendance of units of the Medical Department should be sent to the office of the Chief Surgeon. If communications, or any matters pertaining to the Medical Department which should properly be referred to the Chief Surgeon, are sent first to some other department, they should be returned without any action taken in order that they may pass through the proper channels.

If such full authority is vested in the Chief Surgeon by the Adjutant General, it will assist in standardizing the work of the officers and noncommissioned officers; it will bring about a better *esprit de corps;* result in economies to the Government and state; it will be a means of expediting transactions, eliminate annoyances in paper work, and will enable the Chief Surgeon to devote time to the better training of the men under him. Many reforms which would be of great benefit to the service, and which are now sadly neglected, could be introduced. Many excellent orders in the military code of our state, as it stands today, cannot be carried out for the simple reason that there is no coordinated medical organization under a responsible and authoritative head.

Medical questions of every character should be referred to the Medical Bureau before being approved by the Adjutant General, and all business connected with the department should be under the direct supervision of the Chief Surgeon. No recommendations, promotions, demotions, appointments, or assignments should be

made without first consulting the Chief Surgeon in order that the latter may know every move made in his department. Under present conditions, appointments are being made and resignations accepted without considering the Chief Surgeon. This very often places him in a position of embarrassment, and, naturally, makes him unfamiliar with the work and personnel of his department. Such action has been taken on many occasions, not intentionally, but, I suppose, from former custom and force of habit. As a result, the Chief Surgeon has been openly ridiculed by his subordinates and openly defied until he has come to be regarded as a mere figurehead.

When I was first honored with the appointment of Surgeon General of the State of Illinois, there was no existing office or place for headquarters. My first official act was to establish an office located with the military bureaus. I also instituted the custom of requiring written and oral examinations of applicants for promotion or commissions and kept on file complete records of these examinations. Then, in order to get in touch with the property in the department, a request was made to have medical property returns from the different organizations submitted to the office of the Chief Surgeon, but it was not deemed advisable, as it was maintained that such returns would entail too much labor. At the present time, as in the past, the property of the Medical Department is handled entirely by the Quartermaster and the responsibility has not rested upon the proper department. As a result, the Chief Surgeon's office never knows what supplies are available. Under existing conditions, I have done the best I could, and if I had not been able to give my time to the work without compensation, the Medical Department of our State Guard would be far less efficient than at present. You can readily see the importance of this vast department being conducted in a businesslike manner. The plan I have just outlined would result in a decided improvement over the method now in vogue. It would enable the officers and noncommissioned officers to know definitely the proper military channels through which a given piece of business must be transacted; it would bring discipline and order out of chaos and promote the general good of the service. The great World War now being waged has demonstrated beyond a doubt that the medical officers are responsible for keeping the men on the firing line, and to their efforts in a large measure will be due the success of many a battle and ultimate victory.

Accustomed as I have been all my life to exactness and businesslike precision in the conduct of my personal affairs and private practice, the numerous checks and hindrances placed upon me in the conduct of the affairs of the Chief Surgeon's office have proven extremely exasperating. I have been forced to conduct an office in a manner which does not properly express myself or my ideals of order and efficiency, and in a manner which I have constantly felt was not fair to myself or to the department, nor conducive to the best interest of the service.

I do not wish to be misunderstood, and I want to add right here that I am not criticising anyone, as destructive criticism is foreign to the intent of this paper, and censorship is far beyond my thoughts and power. My connections with my Commander-in-Chief and the Adjutant General have at all times been of the most friendly and pleasant nature. I am not passing judgment on the merits or qualities of my superiors, as up to the present they have allowed me privileges in the conduct of the Medical Department to a far greater extent than when I first entered the service. But with the improvements which have been made since I was honored with the position as head of the Sanitary Troops of our state (and they are considerable), I feel that there are still greater advances to be made for the good of the service. It is for this reason, and for this reason alone, that I am here to ask your cooperation to help improve the Medical Departments of our states by propaganda work.

Everything has a beginning, and why, let me ask, should we not begin right now to cast off our antiquated method of conducting our Medical Department and organize and systematize an up-to-date business method of conducting military medical affairs which shall be nation-wide in its scope.

The system of the Medical Department of each state should be along the lines of the government system, which would enable an officer to be transferred readily from one state to another, if required, without the interference of various systems. The medical officers of the different states should be instructed and trained alike in all its branches, as in this manner the highest efficiency will be attained. If it should ever be desired to interchange medical officers from one state to another, in time of need, the uniformity in the conduct of the business of this branch of the service in all our states would make such transfers possible without difficult readjustments. If, in the future, universal service is adopted, it

appears to me this system will be of paramount importance. In other words, the Medical Department of the whole United States should be under the same system and handled like one large office. It would make general correspondence more systematic and more thoroughly understood. The standard for medical examinations should be uniform, and the requirements and questions for examinations arranged through the Surgeon General of the United States Army. Before receiving a commission, the applicant should be required to attain a certain grade or standard, which, likewise, should be uniform throughout the nation.

To summarize, in conclusion, I am advocating, first, the centering of full power over the State Military Medical Department in the Chief Surgeon, and second, the adoption of a standard system which shall be accepted by all states with only such slight changes as varying conditions may require. To this task I strongly urge the cooperation of the members of our organization.

EDITORIAL

A POSSIBLE ADVANCE IN THE TREATMENT OF PROTOZOAL INFECTIONS OF THE CENTRAL NERVOUS SYSTEM

When Ehrlich announced his results with organic arsenic in 1910 it was hoped that a *therapia sterilans magna* had been put in the hands of the medical profession. It was not long, however, before it became evident that, although the method of treatment was a long step forward, it did not measure up to the standard sought for. While protozoal infections in the early stages yielded to administration of either arsphenamine or neoarsphenamine, it soon became evident that after invasion of the central nervous system they stubbornly resisted this method of treatment. Simple reasoning showed that this might be due to one of two conditions: either that arsenic administered intravenously did not reach the cerebrospinal fluid and the nerve parenchyma in sufficient quantity to be effective, or that it did not reach there in an effective parasiticidal form. Swift and Ellis,[1] Wechselmann,[2] and Marinesco[3] held the premise and believed this due to the fact that the drug would not pass the choroid plexus, and on this belief was founded the theory and practice of the Swift-Ellis method of treatment.

Dr. Carl Voegtlin of the United States Public Health Service does not concur altogether in this opinion as the following, abstracted from a recent report,[4] shows:

First of all it should not be forgotten that our knowledge of the formation and absorption of the cerebrospinal fluid is far from complete; and even less do we know the path that drugs and other substances foreign to the fluid take. . . . Whether or not drugs which can gain access to the cerebrospinal fluid must of necessity pass from the general circulation through the choroid plexus is not a settled question, though it is possible this may be the case.

The second objection is that the arsenic content of the cerebrospinal fluid after intravenous injection of an arsenical is no index of efficiency against parasites in the cerebrospinal fluid, and less as to those imbedded in nerve tissue, since it was shown[5] that the trivalent oxides are the only form directly toxic to these parasites and there is no certainty as to whether the arsenic found in the cerebrospinal fluid is in active form.

---

[1]Swift, H. F., and Ellis, A. W. M. (1912); N. Y. Med. Jour., xcvi, 53.
[2]Wechselmann, W. (1912); Deut. Med. Wochschr., xxxviii, 1446.
[3]Marinesco and Minea (1914); Compt. rend. Soc. de biol., lxxvi, 672.
[4]Voegtlin, C., P. H. Reports, Vol. 38, No. 19, May 11, 1923.
[5]Voegtlin, C., and Smith, Homer W. (1920); Jour. Pharmacol. and Exp. Therap., xv, 475.

Finally, there is no direct proof that this arsenic has power to penetrate the nerve parenchyma and attack the parasites there located.

The above briefly outlines the problem of establishing a successful method of treatment of parasyphilis and human trypanosomiasis by one of the various forms of arsenic. Investigation has been made along two lines, the chemical and the biological. In 1921 Voegtlin and Thompson[6] published results of experiments involving the chemical side, and in the same year Smith and Voegtlin along the biological. In the experiments described by Voegtlin[4] the chemical problem dealt with: (1) the rate of disappearance of arsenic from the blood; (2) the arsenic content of the cerebrospinal fluid; (3) the arsenic content of the brain tissue. The biologic part concerned itself with parasiticidal effect obtainable from intravenous injection of various arsenicals on parasites which had previously been placed in the cerebral subarachnoid space. The parasite employed in these experiments was the *Trypanosoma equiperdum* of the standard strain of the Hygienic Laboratory of the U. S. Public Health Service. The drugs first investigated were arsphenamine and neoarsphenamine and doses corresponding to those used in the treatment of syphilis in man had only a slight effect on the parasites in the subarachnoid space; for example, a dose equivalent to 0.06 in a man of 60 kilos weight gave a percentage efficiency of 11; a dose four times as large, or one-third the fatal dose, a percentage efficiency of only 75, while a higher dose, two-thirds the minimum lethal dose, showed a drop to 57 per cent efficiency. Silver arsphenamine and "arsenoxide" as well as methylarsonic acid, commercially marketed as "Arrhenal," showed only insignificant efficiency.

The unsatisfactory action of this group led to the consideration of the pentavalent arsenicals, especially since it has been shown that sulpharsphenamine readily penetrated tissue and had a much greater solubility than either arsphenamine or neoarsphenamine. Atoxyl and arsacetin, although of therapeutic value in the treatment of human trypanosomiasis were discredited on account of their tendency to induce visual disturbance up to permanent blindness.

Tryparsamid (the sodium salt of N-phenylglycineamid-p-arsonic acid), a derivative of atoxyl reported by Jacobs and Heidelberger[7] and tested by Brown and Pearce,[8] has given fairly satisfactory effects, and "oxyamino" (3-amino-4-oxy-phenylarsonic acid) may be classed with it and is of interest since it is probably the salt formed in the body from arsphenamine.

---

[6] Voegtlin, C., and Thompson, J. W. (1921); Jour. Pharmacol. and Exp. Therap., xx, 85.
[7] Jacobs, W. A., and Heidelberger, M. (1919); Jour. Am. Chem. Soc., xli, 1581.
[8] Brown, W. H., and Pearce, L. (1919); Jour. Exp. Med. xxx, 417, 437, and 455.

Voegtlin, in view of his studies and the effects obtained in animal experimentation recommends that an exhaustive clinical trial be made of sulpharsphenamine, tryparsamid and "oxyamino," especially in view of the hopeless situation in the later stages of human trypanosomiasis and neurosyphilis under treatment with the arsenicals now in common use. The conclusions of his report are, in part, that arsphenamine, neoarsphenamine, silver arsphenamine and allied compounds have a relatively low effectiveness unless very large doses are used. That sulpharsphenamine is the most effective arsenobenzene derivative studied and compares favorably with the highly effective aromatic pentavalent arsenicals, which appear to possess much greater therapeutic power than the well-known arsphenamines. That a greater therapeutic effect can be expected from large single doses, given at longer intervals, than from smaller doses administered more frequently. That sulpharsphenamine, tryparsamid and "oxyamino" are of superior penetrative power.

Farther pursuit of these investigations of Voegtlin and others may give us the key to a situation which up to the present has left us relatively helpless in the matter of the betterment of those suffering from the latter stages of these two serious parasitic diseases; may lessen the population of our insane asylums and put some on their feet who now move only in wheel chairs. Even if it be only a matter of surer prophylaxis rather than of cure it seems as though we shall have at our command a remedy of much more certain effect than the organic arsenicals which are now our main dependance.

In this connection it may not be amiss to reflect that we should not on this account lose sight of the possibility of the existence of two types of the *spirochaeta pallida*, which Levaditi and Marie denominated the dermotropic and neurotropic strains.

James Robb Church.

ASSOCIATION NOTES

COMING MEETING AT CARLISLE BARRACKS, PA., OCTOBER 4-6, 1923

In response to inquiries regarding the question of accommodations during the period of the coming meeting at Carlisle Barracks, the following information has been furnished by Col. P. M. Ashburn, M. C., the present Commandant of the Medical Field Service School. Effective with the first of August, 1923, Col. Charles R. Reynolds, M. C., U. S. Army, will succeed Colonel Ashburn as Commandant of the school:

1. The accommodations for members of the Association at Medical Field Service School:

(*a*) Room, bed, bedding, towels, bedroom service and laundry, $0.50 per day.

(*b*) Mess and dining-room service, $1.50 per day; no rebate for meals missed.

Approximate cost of above to each member, $2.00 per day.

Bed rolls need not be brought, and either uniform or civilian clothes may be worn.

2. Following is a list of principal hotels at Carlisle and Harrisburg, and the prices quoted by each:

Hotel Carlisle:

Rooms without bath, single	$2.00
Rooms without bath, double	4.00
Rooms with bath, single	2.50
Rooms with bath, double	4.50 and up

Meals a la carte.

Hotel Argonne:

Rooms	$1.00
Rooms, with running water	1.50

Separate baths. Meals a la carte.

Hotel Wellington:

Rooms, single	$1.50 and $2.00
Rooms, double	2.50 and 3.00
Rooms with bath, single	2.50
Rooms with bath, double	3.50

Meals, American and a la carte.

Hotels—Harrisburg

Penn-Harris:

Rooms without bath	$2.50
Rooms with bath	$3.00, $3.50, $4.00

Meals a la carte.

Hotel Columbus:
Rooms without bath..... $2.00 and $2.50
Rooms with bath..... 3.00 and 3.50
Meals a la carte.

Bolton Hotel:
European plan..... $2.00 to $3.50
American plan..... 4.00 to 5.50

Senate Hotel:
Rooms without bath..... $2.00
Rooms with bath..... 3.00

3. There are no housing accommodations available for the entertainment of lady members of the families of delegates at Carlisle Barracks. There is an officers' recreation room, however (Red Cross House), which can be used as a hostess house and placed at the disposal of visiting ladies during the period of the convention; simple lunches such as milk, coffee, sandwiches, small cakes, etc., can be served to them there by the Post Exchange.

4. It hardly seems feasible to attempt to publish a schedule of trains entering and leaving Harrisburg, as the number of them is so great and each man will have to look up his own, depending upon the part of the country from which he comes.

Following is a list of trains between Harrisburg and Carlisle:

Leave Harrisburg	*Arrive Carlisle*	*Leave Carlisle*	*Arrive Harrisburg*
4:45 A.M.....	5:33 A.M.	2:37 A.M.....	3:10 A.M.
7:05.....	7:58	5:20.....	6:05
8:15.....	8:54	7:00.....	7:45
9:48.....	10:30	8:40.....	9:12
11:59.....	12:37 P.M.	10:45.....	11:20
3:23 P.M.....	4:03	12:46 P.M.....	1:25 P.M.
3:40.....	4:16	2:06.....	2:40
5:20.....	6:05	4:40.....	5:25
5:45.....	6:28	5:45.....	6:15
6:30.....	7:15	6:17.....	6:57
7:45.....	8:20	8:35.....	9:15
11:10.....	11:45	12:06 A.M.....	12:40 A.M.

It will be feasible to have Carlisle trains met by representatives of the post and to furnish transportation from the station in Carlisle to the post. It would not be feasible or necessary to attempt to run a bus line between the post and Harrisburg as the train schedules are good and in addition there is a trolley line between the two places, running cars hourly.

5. There will be a room available as the office and headquarters of the Association.

The tentative program, subject to possible change, is as follows:

Oct. 4: Preliminary Meeting, Reports, Demonstration of New Equipment for Medical Troops and Units.

Oct. 5: All Day Demonstration of Lines of Medical Aid from the Firing Line back to and including the Field Hospital.

Oct. 6: Final Meeting, Election of Officers, Presentation of Papers. Adjournment.

COMMENT AND CRITICISM

A NEW METHOD OF TREATMENT FOR CHRONIC INFECTIONS INVOLVING BONE[1]

For the past few years our attention has been turned very strongly toward the problem of the acute or chronic infected bone wound. This refers to the various forms of acute and chronic osteomyelitis as well as to compound bone injuries. So many phases of the problem have been thoroughly discussed in addresses and in our journals, that it is sufficient simply to mention them. One need not refer in detail to many of the things that have been said on the subject.

Among the measures that we have been exhorted to employ are debridement with primary or with secondary closure of wounds, the Carrel-Dakin method, zinc solutions, etc. Secondary sterilization by operation and closure has been extensively employed, and all the old and new resources of asepsis and antisepsis in the treatment of chronic infections have been tried. In spite of all these, however, there still remain not only in the military hospitals but in civilian hospitals and in private homes, thousands of patients with chronic discharging infected sinuses which lead from the skin surface through openings large or small down to infected bone. These are accompanied in many instances by serious deformity or disability, of the affected part, whether the bones are those of the spine or of the extremities.

The writer of this paper has seen not only in print but in the military and civilian hospitals every phase of this problem. Not only that, he has himself during twenty years of practice tried most of the methods which with some of the new ones he thinks should now be discarded in the treatment of these conditions. Most of the methods have definitely been found to be wanting. The patients do not get well.

In spite of this fact these inefficient methods are still being employed by surgeons and physicians, in a vain effort to heal up sinuses that will not heal.

The writer believes that he has arrived at a fairly standard method which may be employed in the treatment of these conditions. He believes that it is possible to lay down a course which can be

[1] Reprinted from The Nebraska State Medical Journal, February, 1923, Vol. VIII, No. 2, p. 50.

applied to practically all such cases, and by which uniform, symmetrical and greatly improved results may be obtained.

First of all one may say that entirely too much attention has been paid to the wound itself. This was so perfectly obvious during the war (and the Carrel-Dakin method was partly to blame) that even then our voices were raised, though not too loudly, against the excess of enthusiasm for this method. Wound treatment, contrary to the impression of many surgeons, is usually of secondary importance to certain other things that will be mentioned except in the presence of the gas bacillus or the tetanus organism.

My attention has just been called again to a paragraph written in 1909 by Dr. M. B. Tinker of Ithaca, N. Y., and which he has just quoted and endorsed in another article in the *Annals of Surgery* of January, 1922. This fairly illustrates the attitude of most surgeons toward the wound question.

> If our wound is aseptic, tetanus and blood poisoning are impossible; bony union and a movable joint are favored; osteomyelitis will not develop; and a useful, if not perfectly normal, extremity will usually be saved.

As a matter of fact this paragraph is misleading, as I will attempt to show. Dr. Tinker's statement must be qualified by other very important considerations such as anatomical reposition of parts about the wound at the time of injury or as soon after as possible, immobilization, splintering to prevent contracture, etc. Suitable precautions must be taken for position, range of motion, drainage, etc., as well as wound healing if the desired results for any particular patient is to be obtained. By such means the welfare of the patient, the function of the part and wound healing are all provided for.

The fundamental basis of the treatment which I propose is founded upon the principle of rest, and this applies to the wound and the wound surfaces as well as to the larger anatomical parts involved in the injury. First of all, then, one must insist that at the time of injury, at the time of primary and secondary treatment, and throughout the entire course of the period of disability, there must be first, restoration of the injured parts to normal relationship; and second, immobilization and protection in correct position until complete healing has occurred. This may be accomplished either by plaster or by suitable splints.

As splints are usually put on, however, this is not accomplished at all. In many hospitals and in the hands of many surgeons,

splints are a source of irritation rather than of relief. Complete immobilization in suitably prepared and properly applied splints never causes pain or disturbance. The same is true of the application of plaster of Paris.

For the wound, therefore, two conditions really must be complied with. First, if the wound is infected it must be drained; this applies, of course, to every part of the wound, no matter how deep or in how many directions it may extend. Second, while draining, it must be dressed in such a way that it is not daily or twice daily reinfected. This is a condition which is only occasionally satisfied. My criticisms of present-day treatment of the conditions I have been discussing are that, as a rule, the parts are not placed in correct position, they are not adequately drained, and as dressed in the average hospital or dressed by the average surgeon, the infection is added to rather than reduced by the daily dressings that are done.

For the past two years especially I have been employing a method in which I have been careful to combine the features that I deem of the greatest importance to contribute to the recovery of such a patient. In operating for osteomyelitis of any kind or degree, the attempt is made to remove all infected tissue. This is usually done by "saucerizing" both soft tissue and bone as suggested by Carrell, Chutro, and others. The wound is cleaned up as thoroughly as possible, and the saucer-like opening of both soft tissues and bone is gently packed with sterile vaseline and gauze. The whole area is then covered with dry sterile gauze and the entire limb or part encased in a well-fitting cast of sufficient extent to completely immobilize the infected part. Casts are not split and no windows are cut. If there is no indication on account of a rise of temperature for a change in dressing, this dressing is left in place for ten days to two or three weeks. Occasionally, on account of temperature or odor, the dressings must be changed earlier. When the dressing is changed it is done by the surgeon or his first assistant. One of the principal points in the treatment is infrequent dressings—that is, rest to the wound.

At the time of changing dressings, it must be done with the same precautions as at the time of the original operation. The wound is cleansed, dried, painted with iodine, a sterile vaseline pack put on, and the whole bandaged into place without in any way seriously disturbing the part or the wound. It should be left at each dressing in much the same condition as at the time of the original operation and first dressing.

By this plan drainage is as free as may be required. As a rule the amount of drainage is small. If the wound has not been entirely cleaned up at the time of operation, or if one gets a mixed infection, there may, of course, be complications as in any surgical wound.

One finds in doing these operations, as in the secondary closures of soft part wounds, that the patient often shows considerable ability to take care of organisms to which he has become accustomed (immunized).

Enough patients have now been treated by us by this method (25 to 30), so that one may say that it is possible to treat such conditions in this way with much better results than formerly and without danger. There have been no serious complications in any case. Several such conditions, even those that have been open for a long time, are soundly healed. On one or two occasions osteomyelitis, even in subacute or the early chronic stage, has been healed up by such an operation and a few dressings at intervals of ten days to two weeks. In others five or six dressings at intervals of ten days or a fortnight have been sufficient in cases where daily dressings had been done for many months before.

There are a number of other important advantages, such as shortening the hospital period, the very great relief to the patient on account of the infrequent dressings, and the simplicity of care from the standpoint of the surgeon. The writer is convinced that in many of these cases the frequent dressings and the complicated technique of the Carrel-Dakin and similar methods not only delays healing of the wound but very greatly interferes with the securing of healing of soft parts and bones in the best functional position. The disturbance of splints, often held to be justifiable in wound treatment (especially in the Carrell-Dakin method), is in fact in such cases often a very serious matter.

Finally, it is desired to mention again some things that the writer has already emphasized; namely, that stiff joints, adherent muscles and tendons, and contracture deformities result not from immobilization, but from inflammation, and damage to, and adhesions of, soft parts as well as of joint surfaces. This is true as well of joints which become stiff as a result of irritative motion and extension of the infection as of those in which the entire joint is destroyed by a tuberculous infection. Real immobilization and real splints will protect all the parts in the vicinity of such wounds, and diminish rather than increase the amount of adhesions, stiffness,

ankylosis, and disability when healing of the first damaged and infected parts has occurred.

H. Winnett Orr, M.D., F. A. C. S.,
Chief Surgeon, Nebraska Orthopedic Hospital.

THE FORTHSTANDING VALUE AND CORRELATIVE STATUS OF FORMS 339 A. G. O. AND 71 M. D.

The Corps of Instructors furnished by the War Department at the Medical Officers' Training Camps was remarkably good, its high average speaking well for the profession from which it was drawn, its members conspicuous for excellence of method and lucidity of thought constituting the high lights of those stressful days of endeavor. That there were others less endowed with Olympian fire, whose wingéd words were somewhat crippled, whose methods savored of the rule of thumb, and whose teachings were of the *post hoc ergo propter hoc* type, may be fairly assumed. The lot of the student officer who strove to master army paper work under the guidance of the latter instructor was not to be envied. Fortunate for him that no effort was made to cover the entire range of army forms, records, and reports, but that only the more essential received attention, in particular those employed by the Medical Department.

If memory serves correctly, Form 71 M.D. (the Surgeon's Morning Report of the Sick) proved one of the most difficult to master; nor may it ever be divorced from the memory-picture of Fort Riley in sub-zero February weather, lashed by northwestern gales laden with the grit and dust of the barren lands of Kansas, of tents illuminated by single candles, nor of hatted and overcoated men grappling with its intricacies. The one-candle-power illumination of the tents was strikingly in consonance with the minds of the men who were groping to find the why and the wherefore of this *pièce de résistance* of "Army red tape"; nor should they be censured for their reaction toward this form in particular, and other forms and records in general, for the fault largely lay in the manner of instruction. For by this method the forms were but lifeless things, dry-as-dust obstacles to be encountered and, if possible, mastered, exhibiting no correlation with the general plan of army records or of army organization.

A second encounter with this famous Form 71 M.D. occurred during recent study in the Correspondence Course authorized by the War Department, at which time it was forcibly brought to mind that the significance, importance, and value of army forms and records would be materially enhanced and intensified if correlation (in general) be

shown, and component value (in particular) be demonstrated. To that end, and as a Document in Evidence offered in behalf of The Army of the United States, Defendant, the following hypothetical (and admittedly extravagant) situation has been devised:[1]

Protocol 1.—The normal status of a soldier is that of physical and mental health; in harmonious accord with his environment; obedient to authority; ready for service.

Protocol 2.—Any departure from Protocol 1 automatically places the soldier out of normal status,—and (likewise automatically) subjects him to investigation by either the Medical Department or Courts Martial authorities.

Protocol 3.—The ordinary forms and records are adequate register and check against the soldier on normal status.

Protocol 4.—Abnormal status requires records in addition and complementary to those of ordinary type.

Protocol 5.—The possibility of securing, at any moment, the last word concerning any soldier on normal status is accomplished by ordinary records (Conf. Prot. 3).

Protocol 6.—The possibility of securing, at any moment, the last word concerning any soldier on abnormal status requires ordinary records plus the additional record, or records, appropriate for his case (Conf. Prot. 4).

Protocol 7.—Accurate information is obtainable only when the essential records are formulated accurately and maintained current; this irrespective of normal or abnormal status.

Beyond reminding ourselves of the fact that Form 339 A.G.O. is closely correlated with Form 71 M.D., and that Form 71 M.D. is essential at Headquarters for daily making up the strength of the Command (both effective and noneffective), discussion would seem to be gratuitous. The following hypothetical situation illustrates the importance and applicability of these two basic reports:

1. There are 48 states in the Union.
2. In each state there is a town, Smithville.
3. From each town there has enlisted in the Army one John H. Smith.
4. The name, the age, the weight, the height, the general configuration and type, of these 48 Smiths are identical.
5. They enlist in the Army on the same calendar day.
6. They each and everyone become sick or wounded (or presumptively sick or wounded) on the same calendar day.

At this point similarity ceases.

[1] It is of course recognized that nothing new is herewith conveyed to the mind of the trained officers of the Regular Establishment, nor perchance to a fairly substantial proportion of the officers of the Medical Reserve Corps; nevertheless the frank obviousness of the conclusion constitutes the strongest warrant, and, by the same token, a yeoman argument in favor of reasonable and lucid methods of teaching army paper work. Yet, on the other hand, it is not to be assumed that in the mind of the writer Form 71 M.D. is beyond fair criticism; for any form that requires so much effort to master, and which permits numerous opportunities for erroneous notations, may well be subjected to critical survey looking toward simplification and clarification.

7. Promptly after enlistment these 48 Smiths have been assigned to 48 organizations widely distributed throughout the United States (proper), Alaska, Porto Rico, The Canal Zone, Hawaii, Guam, and the Philippine Islands.

Paragraphs 1 to 6, inclusive, portray 48 Smiths, so nearly as possible, absolutely identical; paragraph 7 shows the widest possible geographic distribution, to which is now added:

8. Absolute dissimilarity regarding type of disease or injury, L.O.D. status, living, dying, or dead, free or under arrest, prevailing rank, bedridden or in process of transfer, sane or insane, status with Q.M. and ordnance supplies, status on payroll, etc.

Granting the postulates laid down in the Protocols, and stressing in particular the accurate maintainance of Form 339 A.G.O. and Form 71 M.D., and yet further disregarding all questions of longitude, time variations, etc., the last word, and the complete record of each of these 48 Smiths, *all of whom are on abnormal status*, may be ascertained by wire by the Adjutant General between 9.00 and 10.00 a. m. on any given day.

Major Norvelle Wallace Sharpe, St. Louis, U. S. A,
Medical Reserve Corps, United States Army.

MILITARY ORDER OF THE WORLD WAR

The Military Order of the World War will hold its National Convention at Washington, D. C., on October 4, 5, and 6, next. Headquarters will be established at the New Willard Hotel.

Elaborate preparations are now under way for the entertainment of delegates, members and guests on that occasion, who will represent the 25 different chapters established throughout the United States. One of the social features of the Convention will be an elaborate Military Banquet and Ball to be given the evening of October 5, and preparations for this particular event include four hundred covers. There will be many military men of prominence in active service, reserve and those who have retired to private life present during the Convention period.

The Commander-in-Chief of the Order is Maj. Gen. Geo. H. Harries, of Chicago, and the Senior Vice Commander-in-Chief is Rear Adm. T. J Cowie, c/o Navy Department, Washington, D. C.

UNITS OF ORGANIZED RESERVES

The following list of units of the Organized Reserves, authorized by the Surgeon General on the dates shown, is furnished for publication in the Military Surgeon:

Veterinary Convalescent Hospital No. 1	Second Corps Area	28 Feb., 1923
General Hospital No. 4	Western Reserve Univ., Lakeside Hospital, Cleveland, Ohio	1 March, 1923
General Hospital No. 57	Western Reserve Univ., Cleveland City Hospital, Cleveland, Ohio	1 March, 1923
Surgical Hospital No. 5	Western Reserve Univ., St. Vincent's Charity Hospital, Cleveland, Ohio	1 March, 1923
Evacuation Hospital No. 25	West Suburban Hospital, Oak Park, Ill.	5 March, 1923
General Hospital No. 1	Bellevue Hospital, New York City	15 March, 1923
Surgical Hospital No. 4	Washington Univ. Medical School, St. Louis, Mo.	23 March, 1923
General Hospital No. 27	School of Medicine, Univ. of Pittsburgh, Pittsburgh, Pa.	5 April, 1923
Veterinary Station Hospital No. 2	Seventh Corps Area	16 April, 1923

BOOK REVIEWS

Protists and Disease. Vegetable Protists; Algae and Fungi including Chytridiineae; various Plassomyxineae, the Causes of Molluscum contagiosum, Smallpox, Syphilis, Cancer, and Hydrophobia; together with the Mycetozoa and allied groups. Being the Sixth Book published by the Author on the same subject. By J. Jackson Clarke, M.B., Lond., F. R. C. S., Senior Surgeon to the Hampstead and Northwest London Hospital, and Surgeon to the Royal National Orthopedic Hospital. 8°, 229 pp. New York: William Wood and Company, 1923.

The author states in his preface that "A change of title from 'Protozoa and Disease' of four preceding books to 'Protists and Disease' has become necessary by reason of my having found that the pathogenic organisms dealt with are not protozoa, but protists allied to Synchytriaceae. In other words, in making comparative study of alien bodies that abound in the lesions of molluscum contagiosum, cancer, and other diseases, we have examined protozoa with great care, when we should have given the closest attention to every detail of the life-history of certain vegetable protists, especially Synchytriaceae and some Olpidiaceae."

"Protists" is defined as a term used for the designation of "the two overlapping subkingdoms or phyla, the Protozoa and the Thallophyta, the latter term applying to the algae and fungi, including the diatoms, the desmids and the bacteria." "The cell-theory" is discussed, and the functions of the nucleus, nucleolus, and of the chromidia—especially in the matter of cell division—are described. The author links up the newer colloidal chemistry with the fundamental properties of protoplasm, and quotes Bayliss to the effect that "The chief cause of stability in colloids is Brownian movement" and that "This movement is seen in many living cells. . . ."

The biology of the algae and the fungi engages attention, and is followed by a chapter dealing with the Chytridiineae. A more extended discussion of the functions of the nucleus in the matter of cellular reproduction is found under the caption "The Synchytrian Nucleus." This is followed by an interesting discussion of "'Cancer-bodies' in Synchytrium and in Syphilis." Perhaps the most interesting chapter from the viewpoint of the clinician is that which deals with "Notes on Smallpox, Syphilis, Cancer, etc." The conclusions at which the author arrives regarding the causative relationship between certain parasites and individual diseases (more particularly cancer and smallpox) will certainly not find universal acceptance at the present time. It cannot, however, be said that because of this fact they are uninteresting.

A. N. Tasker.

How We Resist Disease, An Introduction to Immunity, by Jean Broadhurst, Ph.D., Assistant Professor of Biology, Teachers College, Columbia University. 138 illustrations and 4 color plates. 8°, 248 pp. Philadelphia and London: J. B. Lippincott Company, 1923.

This small contribution to the literature of immunology, while it is not included in the list of Lippincott's Nursing Manuals, is yet of a kind with the members of that series, having due regard to the enormously involved intricacies of the subject with which it deals. No manual including within the space of two hundred odd pages so satisfactorily clear and simple a discussion of bacteria, active immunity, passive immunity, toxins and antitoxins, agglutinins and precipitins, opsonins, white corpuscles, lysins, vaccines, anaphylaxis, and similar phenomena has within recent memory been received by the Military Surgeon for review. It is very adequately illustrated without overdoing the matter. The arrangement of the work as a whole and of the individual subjects is entirely and satisfactorily logical. It includes a glossary of immunological terms, a list of infec-

tions and causal organisms discussed in the text, and an index. The most noteworthy omission is that of bibliographies. There is not a single reference or footnote on any page, nor has there been found any trace of a bibliography either after the individual chapters or elsewhere in the book. Yet by no stretch of the imagination could it be assumed that the author looks upon all the information contained between the two covers of her treatise as originating with her, and since she has intended it primarily for the use of college students, nurses, and those not specializing in this particular field, it may perhaps have been thought that extensive bibliographies were not worth the additional space and expense. The volume will be of much interest to students of biology, to physicians not primarily concerned with immunology but who desire a broad view of that domain, and to the educated and inquiring layman who seeks to keep himself *en rapport* with the important advances in biological science.

A. N. Tasker.

The Pathological Physiology of Surgical Diseases, A Basis for Diagnosis and Treatment of Surgical Affections, by Professor Dr. Franz Rost, University of Heidelberg. Authorized Translation by Stanley P. Reimann, M.D., Chief of Pathological Department of the Lankenau Hospital and Assistant Professor of Experimental Pathology, University of Pennsylvania, Philadelphia, Pennsylvania. With a foreword by John B. Deaver, M.D., LL.D., Sc.D., F.A.C.S. 8°, 535 pp. Philadelphia: P. Blakiston's Son & Co., 1923.

Every surgeon must be in some measure a pathologist, since upon a knowledge of pathology depends accuracy in diagnosis without which the surgeon—brilliant operator though he may be—is essentially a technician and only a technician. In the volume here under review the surgeon will find innumerable reference facilities to aid him in his dilemmas. The style is direct, succinct, almost terse, in noteworthy contradistinction to the unnecessary verbiage so often encountered in textbooks from certain foreign sources.

The first chapter is taken up with the oral cavity, salivary glands, tongue and esophagus; the next six chapters with the various abdominal structures; the eighth with the kidneys, bladder, and male genitalia; the ninth with the thyroid gland; the tenth with the chest cavity; the eleventh with the brain and spinal cord; and the twelfth with the extremities. Each chapter is concluded by an unusually voluminous index to the literature which has been consulted in the preparation of that chapter. An index of authors and an extensive subject index are to be found at the end.

A peculiar and regrettable feature of the book is the entire absence of illustration of any sort. It is true that the subject-matter does not lend itself to illustration as readily as in the case of a textbook of orthopedic surgery, for example; none the less, there are places where photomicrographs and roentgenograms might have been introduced to advantage, for it cannot be denied that illustration serves to impress and fix the titles of the subject matter to which it relates in a manner peculiarly its own. In spite of this omission the work is, however, one of unusual value in offering to the surgical diagnostician much information which he should find helpful in the face of difficult cases.

A. N. Tasker.

Multiple Sclerosis [Disseminated Sclerosis], An investigation by The Association for Research in Nervous and Mental Diseases. Report of the Papers and Discussions at the Meeting of the Association; New York City, December 27 and 28, 1921. Editorial Board: Charles L. Dana, M.D., Smith Ely Jelliffe, M.D., Henry Alsop Riley, M.D., Frederick Tilney, M.D., Walter Timme, M.D. 8°, 241 pp. New York: Paul B. Hoeber, 1922.

This volume forms one of a series of investigations and reports with which the Association for Research in Nervous and Mental Diseases has concerned itself. The first volume

of the series on "Acute Epidemic Encephalitis [Lethargic Encephalitis] was published in 1920, and a third volume dealing with "Epilepsy and the Convulsive State," in 1922. The editorial board charged with the preparation of this series consists of Drs. Charles L. Dana, Smith Ely Jelliffe, Henry Alsop Riley, Frederick Tilney, and Walter Timme. The work is introduced by a chapter on "General and Historical Considerations, Geographical and Racial Distribution, Incidence and Frequency, General Etiological Factors in Multiple Sclerosis, Exogenous Causes, Ecology and Conclusions." The conclusions reached are as follows:

1. The age of persons suffering from multiple sclerosis ranges chiefly from twenty to forty, but the disease may occur as early as the tenth or as late as the sixtieth year.

2. The disease occurs more often in males than females in the ratio of about 3 to 2; and makes up about 1 to 2 per cent of the organic diseases of the nervous system including those due to syphilis.

3. The duration of the disease averages about eight years but may run less than a year or more than thirty years.

4. It occurs in persons doing skilled manual work more often than in ordinary laborers or in brain workers.

5. In the United States it seems to occur more in the region of the Great Lakes—at least among young males, while in Europe it prevails more in northern parts than in Italy and about the Mediterranean Sea.

6. It is not a familiar disease, and is not inherited, there being rare and doubtful exceptions; but in the ancestry there is often evidence of a neuropathic stock.

7. Acute infections may immediately precede the disease in a small percentage (10 or 12 per cent), and it occurs no more frequently in persons who have had the usual children's infectious fevers than in those who have not had them (Barker).

8. It is not caused by syphilis.

9. In a small percentage of cases the disease appears to be excited by trauma, but trauma cannot itself cause the disease, and only may apparently awaken a disease process already potentially existent.

10. Further laboratory studies and the use of prolonged and intensive field work including some of the methods suggested by ecology are necessary to give us a knowledge of the real cause of multiple sclerosis, which cause we do not now know.

The chapter on "General and Special Symptomatology" includes three statistical tables which serve to present an analysis of the various signs and symptoms with great clarity. These tables are deemed worthy of reproduction in full.

TABLE 1.—*Signs and Symptoms of Multiple Sclerosis in the Order of their Diagnostic Importance Based upon the Study of* 141 *Cases.*

	Per cent
1. Easy fatigue, weakness and stiffness of one or both upper or lower extremities culminating in spastic paraplegia	81.7
Associated with—	
(*a*) Increase of deep reflexes	90.0
(*b*) Positive Babinski sign	78.3
2. Nystagmus, generally horizontal, slight at the beginning, gradually becoming more marked	70.0
3. Ataxic tremor of upper extremities and tremor of the head	55.3
4. Marked diminution or loss of abdominal reflexes	83.7
5. Spastic ataxic or ataxic gait and station (including the Romberg symptom)	43.2
6. Scanning speech or some form of dysarthria	36.0
7. Pallor of optic discs, especially of the temporal halves	32.6
8. Disturbance in facial innervation, often very slight	32.6
Deviation of tongue	10.0
Disturbance of deglutition	3.5

9. Explosive laughter and emotional instability	17.0
10. Unusual remissions often leading to disappearance of symptoms	42.0
11. Transitory ocular palsies with diplopia	29.0
12. Vague objective and subjective sensory disturbances:	
(*a*) Objective (1) Posterior column disturbance	17.0
(2) Pain, touch and temperature disturbance	16.3
(*b*) Subjective: Numbness, tingling and pain	30.0
13. Disturbance in vesical (not rectal) reflexes	40.0
(Hasty or delayed micturition); incontinence in 21 cases	14.0
14. Tenderness of the spine, chiefly mid-dorsal	12.0
15. Dizziness (vestibular vertigo)	8.25
16. Mental changes	15.6
17. Auditory nerve involvement	2.0

Important Negative Signs and Symptoms

1. Pupils generally active with occasional hippus.
2. Biologic tests negative except for the occasional presence of globulin and slight increase in the number of cells in the spinal fluid in a few instances.
3. Colloidal gold curve reported as paretic by some writers. Not sufficiently studied in this series.

TABLE II.—*Symptoms and Signs Enumerated in the Order of the Frequency of their Occurrence*

Total Number of Cases Studied 141 (Male cases 77, Female 64)

	Per cent
1. Spinal fluid was negative in 114 out of 122 cases studied	93.0
In 19 cases there were no spinal fluid studies. The blood Wassermann test was negative in all but one instance in which the outcome was three plus. In 5 cases there is no record of a blood Wassermann test. Spinal Wassermann test was negative in all the cases studied.	
In 3 cases the globulin in the spinal fluid was increased	2.1
In 8 cases the cell count was above normal, the figures being 12, 13, 16, 16, 20, 30, 40 cells respectively	6.8
2. Abdominal wall reflexes were markedly diminished or absent in 118 cases	83.7
3. The chief complaint in 115 cases was weakness and stiffness of one or both lower extremities	81.7
4. Nystagmus was present in 99 cases	70.0
It was chiefly horizontal.	
Horizontal and vertical in 17 cases	12.0
Horizontal and rotary in 3 cases	2.0
5. Babinski's sign was present bilaterally in 94 cases	67.0
Unilaterally in 16 cases	11.3
6. Tremor was present in the extremities alone in 78 cases	55.3
In 31 cases there was also tremor of the head	22.0
7. Ataxia and adiadokokinesis were present in 66 cases	47.0
8. Deep reflexes in the lower extremities were increased in 126 cases	90.0
Ankle clonus was present in 61 cases	43.0
Patellar clonus was present in 29 cases	20.5
In 3 instances the knee-jerks were diminished and in 3 cases the ankle-jerks were diminished (tabetic type).	
9. There was a history of 1 or more remissions in 59 cases	42.0
10. There were bladder symptoms in 57 cases	40.0
Urgency was present in 18 cases.	
Delay in starting urinary stream alone or in combination with urgency in 28 cases and incontinence in 21 cases.	
11. Speech was hesitant or otherwise disturbed in 51 cases	36.0
12. The gait was spastic in 43 cases	30.0
Spastic ataxic in 46 cases	32.6
Ataxic alone in 15 cases	10.6
13. In 46 cases there was evidence of facial weakness	32.6
The other cranial nerves were very much less involved.	
The tongue deviated to the right in 14 cases	10.0

There was difficulty in swallowing in 5 cases	3.5
Uvula was drawn to one side in 4 cases	2.8
The cochlear nerve was involved in 3 cases	2.0
In 2 cases the vestibular nerve showed no response to stimulation	1.4
Of the ocular muscles the internal rectus was involved 6 times	4.3
In 2 cases there was ptosis	1.4
In 3 cases the external rectus was involved	2.8
These last figures are rather interesting in view of the frequency of diplopia in multiple sclerosis.	
14. Temporal atrophy was noted in 46 cases	32.6
In 11 cases there was blurring of the discs or mild optic neuritis	7.8
Vision was impaired in 25 cases without objective disc findings	17.7
15. Sensory changes were both subjective and objective. Pain, numbness and tingling were noted in 43 cases	30.0
Objective disturbances in posterior column sensation were present in 24 cases	17.0
Mild changes in pain, temperature and touch perception were noted in 23 cases (among these were cases with hyperalgesic zones)	16.3
Astereognosis was noted in 5 cases	3.5
16. There was a history of diplopia in 31 cases	29.0
17. Cremasteric reflexes were diminished in 17 of the male cases	22.0
18. Mental changes were noted in 22 cases. They were largely those of mental infantilism and signs of neurosis or neurasthenia. One patient was in a state hospital with the diagnosis of dementia praecox. One patient showed the picture of Korsakoff's psychosis.	15.8
19. 24 cases showed emotional instability with explosive laughter	17.0
7 cases showed defects of memory	5.0
20. Spinal tenderness was present in 17 cases	12.0
It was chiefly middorsal.	
21. In 14 cases there was a history of trauma	10.0
Two cases had shown symptoms of lead poisoning.	
One patient had suffered from wood alcohol poisoning.	
The disease followed operation in 2 instances and in 1 case it developed as a result of fright.	
22. Pupillary disturbances were noted rarely.	
Pupils were irregular in 6 cases	4.3
They were slightly sluggish to light in 12 cases	8.5
Ainsocoria was present in 16 cases	11.3
23. In 12 cases there was a history of marked dizziness	8.5
24. Disturbance of potency was noted in 6 cases	4.3
No disturbance in rectal control was seen in any of our cases.	

TABLE III.—*Comparative Incidence of Multiple Sclerosis and Lues of the Central Nervous System*

At Montefiore Hospital for Chronic Diseases, 1914–21 Inclusive

	Cases
Multiple sclerosis	50
Lues of the central nervous system	167
(*a*) Cerebrospinal lues	65
(*b*) Tabes	85
(*c*) General paresis	17

At Mt. Sinai Hospital, 1912–21 Inclusive

	Cases	
Total admissions to the neurologic service	2,357	
Multiple sclerosis	90	(3.8%)
Lues of the central nervous system	562	(23.8%)
(*a*) Cerebrospinal lues	317	
(*b*) Tabes	160	
(*c*) General paresis	85	

The diagnosis and pathology are discussed at length in the last two chapters, and the volume is concluded by a very complete and comprehensive bibliography. The importance of the bibliographical references in the minds of the editorial board is indicated by the fact that they elevate the bibliography to the dignity of a chapter.

The plan of the Association for Research in Nervous and Mental Diseases, by virtue of which it proposes issuing investigations and reports upon individual diseases, is unique and of great interest. Groups of men of exceptionally high attainment, associating themselves together for the specific purpose of elucidating individual problems, cannot but command, because of the very fact of such association, the world-wide interest of their colleagues for the results of their research. It requires no oracular powers to foretell the fact that this series when concluded will form a compendium of "the world's best literature" on nervous and mental diseases.

A. N. Tasker.

What Comes from What, or the Relationships of Animals and Plants, by Charles L. Abbott. Published by the author, 600 Ivy Street, St. Paul, Minn. 8°, 48 pp., 1922.

This is a series of diagrammatic tables representative of the progress of evolution. The diagrams deal individually with "Bacteria." "Flagellata," "Pteridophyta," Gymnospermae," "Angiospermae," "Monocotyledones," "Poales," "Rosales," "Celastrales," "Hypericales," "Polemoniales," "Asterales," "Spongida," "Coelenterata," "Annelida," "Araneida," "Insecta," "Rhynchota," "Lepidoptera," "Hymenoptera," "Diptera," "Coleoptera," "Mollusca," "Elasmobranchii," "Fishes (1)," "Fishes (2)," "Batrachia," "Reptilia (1)," "Reptilia (2)," "Birds (1)," "Birds (2)," "Birds (3)," "Birds (4)," "Mammalia," "Insectivora," "Artiodactyla," "Carnivora," "Condylarthra," "Cetacea," "Proboscidea," and "Primates," and are briefly commented on in the printed text. The pamphlet is introduced by a "Time-table of the Earth" in which the times relate to the beginnings of the respective periods:

CENOZOIC

(2) *Quaternary*

	Years
Recent—Incalculable, but probably	50,000
Pleistocene (Glacial period)	400,000

(1) *Tertiary*

Pliocene	1,700,000
Miocene	3,100,000
Oligocene	4,300,000
Eocene	6,300,000

MESOZOIC

Cretaceous (Upper Cretaceous)	8,700,000
Comanchean (Lower Cretaceous)	10,700,000
Jurassic	11,500,000
Triassic	13,200,000

PALAEOZOIC

Permian	14,400,000
Carboniferous (Pennsylvanian and Mississippian)	17,300,000
Devonian	19,500,000
Silurian (Upper Silurian)	21,000,000
Ordovician (Lower Silurian)	22,700,000
Cambrian	25,300,000

PROTEROZOIC

Keweenawan	30,300,000
Animikian	31,700,000
Huronian	33,500,000

ARCHAEOZOIC

Archaean (Laurentian, etc.)	100,000,000

A. N. TASKER.

MISTAKES AND ACCIDENTS OF SURGERY; by Harold Burrows, C.B.E., M.B., B.S., (Lond.), F.R.C.S., Assistant Surgeon at the Royal Portsmouth Hospital; Late Consulting Surgeon to the British Expeditionary Force in France; Late Hunterian Professor of Surgery at the Royal College of Surgeons of England; Late Senior Assistant Surgeon to the Seamen's Hospital, Greenwich. 8°, 470 pp. New York: William Wood and Company, 1923.

The author compares the surgeon of today with the sea captain of former years who sailed uncharted waters under the guidance of nebulous and doubtful signs. Innumerable surgical dangers threaten the operator in each first trial of new procedures. To locate some of the danger points in surgical geography is the purpose of this volume. The author frankly acknowledges that the inspiration of his writing is "a sorrowful contemplation of the many surgical errors which I myself have committed."

Examination of the text reveals that it deals with only those phases of surgery which are indicated in the title, namely, the "Mistakes and Accidents of Surgery." As an example of the general tenor of discussion of individual subjects, it may be legitimate to glance for a moment at one of the most important of all surgical conditions, namely, "Appendicitis." "The majority of misadventures in appendicitis arise in connection with the diagnosis." Concerning the confusion of appendicitis with lead poisoning it is stated that there are two ways in which the surgeon may be misled. He may fail to observe the classic manifestations of plumbism (such as blue line on the gums, pallor, and possibly wrist drop) and may, therefore, lay himself liable to the charge of having performed an unnecessary laparotomy. But, on the other hand, he may overstress the evidences of the presence of lead and thus be led to ignore an actually existing appendicitis. The visceral crises of locomotor ataxia sometimes lead to a mistaken diagnosis of appendicitis. Acidosis, more particularly in children, frequently presents manifestations which are misconstrued as evidences of appendicitis. Abdominal pain (referred) on the right side, together with muscular rigidity, may result from right-sided pneumonia, pleurisy, and empyema. Such cases have been often operated in the expectation of finding appendiceal disease when no such disease existed. Certain cases of acute endocarditis are accompanied at the time of onset with intense abdominal pain, collapse, and rigidity of the abdominal muscles. In tuberculosis of the spine, and more particularly when complicated by psoas abscess, the patient may complain only of abdominal pain; he may lie with the right thigh flexed upon the abdomen to relax the psoas muscles; and he may be distinctly tender in the region of the appendix. Real appendicitis may be mistaken for disease of the hip joint. Renal lesions "may be confused with appendicitis on account both of their general effects and also their local disturbances." Uraemic vomiting, if accompanied by abdominal pain and tenderness, may suggest appendiceal involvement. Ureteral calculus is another stumbling block in the correct diagnosis of appendicitis. The pyelitis seen in pregnant women is frequently mistaken for appendicitis. Such intraabdominal conditions as constipation, peptic ulcer, cholecystitis, gall stones, tuberculous peritonitis, pelvic disease, cancer of the gastrointestinal tract, and intestinal obstruction

may all be misread in terms of appendicitis. The diagnostic difficulties in such cases as these need no detailed comment to make them evident.

The individual phases of surgical difficulty with which the book deals are indicated in the following table:

SECTION I

Head and Neck

I. Head Injuries.
II. Tuberculous Glands in the Neck.
III. Goitre.
IV. Tracheotomy.
V. Epithelioma of the Tongue.
VI. Swellings of the Salivary Glands.
VII. Tonsils and Adenoids.

SECTION II

Thorax and Breast

VIII. Pleural Effusion.
IX. The Mamma.

SECTION III

Abdomen

X. Diagnosis in Acute Abdominal Disease.
XI. Abdominal Injuries.
XII. Laparotomy.
XIII. Appendicitis.
XIV. Intestinal Obstruction.
XV. Operations on the Stomach.
XVI. Intussusception in Babies.
XVII. Hernia.
XVIII. Affections of the Liver and Bile Ducts.
XIX. The Spleen.

SECTION IV

Kidney, Ureter, and Pelvic Organs

XX. Kidney and Ureter.
XXI. Bladder, Prostate, Urethra, and Penis.
XXII. Female Genital Organs.
XXIII. Rectum.

SECTION V

The Extremities

XXIV. Amputations.
XXV. Fractures.
XXVI. Deformities.
XXVII. Injuries and Diseases of Joints.

SECTION VI

Miscellaneous

XXVIII. Varicocele, Hydrocele, and Swellings of the Testicle.
XXIX. The Blood Vessels.
XXX. The Spine.
XXXI. Surgical Infections.
XXXII. MalignantDisease.
XXXIII. Anaesthesia.
XXXIV. Accidents of the Operation Room.

SECTION VII

XXXV. A General Consideration of the Sources of Surgical Errors.

A. N. Tasker.

Inflammation in Bones and Joints, by Leonard W. Ely, M.D., Associate Professor of Surgery, Stanford University. 144 illustrations. 8°, 433 pp. Philadelphia and London: J. B. Lippincott Company, 1923.

Bone disease in general is unique in that it is confined within "a narrow case or shell."

The specific structure, the compactness, and the unyielding rigidity of this shell very greatly modify the semeiology of its diseases as compared with those of the soft structures. Again, there are to be found in close relationship with the bones certain closed cavities—the joints—which, having a relatively poor blood supply, offer a very favorable nidus for the growth of bacteria. The joints present a peculiar combination of characteristics in that their "soft tissues" are comparatively small in amount whereas their mobility is extensive, especially in the joints of the extremities. The pain and other manifestations of disease which therefore present themselves in connection with the joints are apt so to predominate as to overshadow the bone involvement and to put their own impress upon the composite clinical picture when both bone and joint are simultaneously affected. The author enumerates six varieties of tissue which demand consideration in inflammation of the bones and joints: (1) Bone tissue proper; (2) bone marrow; (3) periosteum; (4) cartilage; (5) synovial membrane; (6) ligaments. To avoid at the outset the possibility of misunderstanding, he proceeds to define these terms:

Bone is an animal substance composed of organic material impregnated with salts of lime and magnesium. Bone cells also are an integral constituent. Bone is divided into two classes: dense, and spongy or cancellous, but the bone in each is the same, and only differs in its arrangement and in its amount.

Marrow is the soft tissue within the bone—all the soft tissue within the bone. Its situation, not its composition, determines its name. Wherever there is bone there is marrow, in the central canal and in the spongy bone, and even to a small extent in the dense bone itself. Tissue with all the characteristics of marrow is occasionally seen in the region of the joints, on the outside of the cortex, immediately under the fibrous periosteum.

Periosteum is the tissue which covers the bone in all places except those covered by the joint cartilage. Its structure and function have been the subject of much discussion, into which we shall not enter at any length here. The difference of opinion is due partly to a lack of exact definition, and partly to faulty reasoning. A knowledge of the subject is advisable if one would understand the subject of bone formation.

Cartilage consists of cells and basement substance. The cells have a definite capsule and a characteristic appearance which often helps to identify the tissue under the microscope. The basement substance consists of collagen fibrils impregnated with chondromucin. Cartilage contains, according to age, 3 to 6 per cent of mineral substances, of which calcium sulphate forms from 48 to 92 per cent.

The synovial membrane is a connective tissue structure which bounds the joint in all places except those bounded by the articular cartilage. It covers intra-articular ligaments, and, in certain joints, notably the knee, is prolonged inward in the form of fringes or curtains. It secretes a viscid fluid which lubricates the joint, and normally is just sufficient to serve this purpose and no more. The membrane is continuous with that lining certain of the bursae in the immediate neighborhood of some joints, so that disease in one readily spreads to the other. There is, of course, no such thing as a hernia of a joint.

The individual and particularized subjects thereafter treated of in order are as follows: "The formation of bone," "the healing of fractures," "bone transplantation," "ankylosis," "arthroplasty," "acute suppurative haematogenous osteomyelitis," "acute suppurative haematogenous arthritis," "suppurative osteomyelitis following compound fracture," "typhoid osteomyelitis and arthritis," "gonococcic osteomyelitis and arthritis," "acute inflammatory rheumatism," "hydrathrosis intermittens," "traumatic arthritis," "suppurative arthritis from wounds," "haemophiliac joints," "chronic osteomyelitis," "phosphorus necrosis," "sclerosing osteomyelitis," "syphilis," "chronic osteomyelitis of unknown origin," "osteomyelitis fibrosa," "Paget's deforming osteomyelitis, ostitis deformans," "leontiasis ossea," "osteomyelitis fibrosa," "ostitis fibrosa," "pulmonary hypertrophic osteoarthropathy," "rickets," "chronic arthritis," "joint tuberculosis in general," "tuberculous arthritis," "tuberculosis of special joints," "tuberculosis of the spine, Pott's disease," "tuberculosis of the hip," "tuberculosis of the knee," "tuberculosis of the ankle and tarsus," "tuberculosis of the calcaneus," "tuberculosis of the shoulder," "tuberculosis of the elbow," "tuberculosis of the wrist," "tuberculosis of the sacro-iliac

joint," "tuberculosis of the fingers and toes," "coccidioidal granuloma," "chronic diplostreptococcic arthritis," "chronic progressive multiple arthritis," "Still's disease, chronic polyarthritis in children," "chronic arthritis of the second type (arthritis deformans)," "Legg's disease," "loose bodies in the joint," "Koehler's disease," "Osgood-Sclatter's disease."

This is not a textbook of orthopedic surgery. While treatment, both operative and non-operative, is adequately handled, yet the work is, after all, just what it purports to be, namely, a clinical and pathological study of "inflammation of the bones and joints," The bibliographies which conclude each chapter are very full and complete. The paper and printing leave nothing to be desired, and the text is richly but not superfluously illustrated by photographs, roentgenograms and schematic diagrams. It is a work of unusual value for the medical student, the general practitioner, and the osteologist and arthrologist.

A. N. Tasker.

Outlines of Zoology, by J. Arthur Thomson, M.A., LL D., Regius Professor of Natural History in the University of Aberdeen; Joint Author of "The Evolution of Sex," Author of "The Study of Animal Life," "The Science of Life," "The Biology of the Seasons," "Heredity," "Darwinism and Human Life," "The System of Animate Nature," etc. Seventh edition, revised, with 437 illustrations. 8°, 869 pp. Edinburgh, Glasgow, and London: Henry Frowde and Hodder & Stoughton, 1920.

Professor Thomson's name is so universally known in the world of science that no other sponsor is needed for the seventh edition of his "Outlines of Zoology." In general this volume follows the plan upon which the earlier editions have been based. A general survey of the animal kingdom shows that it is divided into two great groups: (*a*) the vertebrates or backboned animals; and (*b*) the invertebrates or backboneless animals. In the first group are to be found the mammals (of which the most distinctive characteristics are lactation in the females, growth of hair on the skin, presence of convolutions on the superficial aspect of the brain, and the occurrence of a diaphragm between the chest and abdomen); the birds (characterized by feathers and wings and other adaptations to flight, a high temperature, frequent sponginess and hollowness of bones, tendency to fusion in many parts of the skeleton, absence of teeth in modern forms, fixedness of lungs and association with numerous air sacs); the reptiles (of which there are five distinct types, viz., the crocodilians, the unique New Zealand lizard, the lizards proper, the snakes, and the tortoises, and which are characterized by their scaly skins, by the absence of gills, and by their being cold-blooded); the Amphibians (nearly all of which have gills, all the adults have lungs, the limbs are fingered and toed, and there is a general absence of an exoskeleton); the fishes (essentially adapted to life in the water and having paired fins together with unpaired median fins, permanent gills, a scaly exoskeleton, and a two-chambered heart containing only impure blood which is driven to the gills, whence, purified, it passes directly to the body); and finally the primitive vertebrates (which include the Cyclostomata, the Cephalochorda, and the Tunicates). Among the invertebrates we find the Molluscs (which are unsegmented and without appendages), the Arthropods (possessed of segmented bilaterally symmetrical bodies, jointed appendages, and a chitinous cuticle), the Echinoderms (characterized by radial symmetry and a characteristic water-vascular system), the segmented worms (difficult of classification), the unsegmented worms (including the free-living Planarians, the parasitic Trematoda, the parasitic Cestoda, and the frequently parasitic Nematoda or thread-worms, the Coelentera (comprising jelly-fishes, sea-anemones, corals, etc.), the Porifera or sponges, and the Protozoa or unicellular animals.

After the chapters on "The Functions of Animals (Physiology)," on "The Elements of Structure (Morphology)," on "The Reproduction and Life History of Animals," on "The Past History of Animals (Paleontology)" and on "The Doctrine of Descent," the study of zoology proper begins with "Phylum Protozoa—The Simplest Animals." This is followed by a chapter on the "Sponges," one on the "Coelentera," on the "Unsegmented Worms," on "Phylum Annelida," on the "Phylum Echinoderma," on the "Phylum Arthropoda," on the "Phylum Mollusca," on the "Phylum Chordata," on the "Structure and Development of Vertebrata," on the "Class Pisces—Fishes," on the "Class Amphibia," on the "Class Reptilia," on the "Class Aves—Birds," on the "Class Mammalia," on the "Geographical Distribution of Animals," and on the "Theory of Evolution."

The same excellence in illustration, in simplicity of diction, and logical arrangement which characterized the older editions of this work are to be found present in equal measure in the more recent volume. The newest discoveries in the zoological sciences have been uniformly caught up and included in this present edition. It remains as ever a standard textbook on the subject. A. N. Tasker.

Clinical Diagnosis, Case Examination and The Analysis of Symptoms, by Alfred Martinet, M.D., of Paris, France, with the collaboration of Drs. Desfosses, G. Laurens, Leon Meunier, Lutier, Saint-Cene and Terson. English translation of the third edition by Louis T. deM. Sajous, B.S., M.D., Philadelphia. Two volumes. Philadelphia: F. A. Davis Company. Price, $14.00.

This work is published in two volumes. Volume I contains the Physical and Laboratory Diagnosis; Volume II contains subject matter pertaining to the analyses of symptoms.

The author introduces his subject in a chapter describing the requirements for a satisfactory diagnosis. In this chapter he defines what he considers to be a satisfactory diagnosis and points out that the trend of modern medicine is such that the pathological or lesional nosology is being replaced by a physiological or functional concept. This chapter is followed by one concerning mistaken diagnoses. The author classes these as due to one of three causes, e.g., ignorance, faulty examination of the patient, or errors of judgment. These are dealt with at considerable length.

Diagnostic procedures are considered under the headings of the various organs or physiological systems of the body. For instance, the chapter entitled "Examination of The Genito-Urinary Tract" is subdivided into—

I. The Genito-Urinary Tract.
   A. General Considerations.
   B. The Kidneys.
      Inspection; points of tenderness; palpation; percussion; cystoscopy and ureteral catheterization in renal disorders; urinary separation; fluoroscopic examination.
   C. The Bladder.
      Evacuation; sensitiveness; instrumental exploration; cystoscopy.
   D. The Male Urethra.
      Catheterization.
   E. The Male Reproductive Organs.
      The penis; shreds in the urine; the prostate; Cowper's glands.
   F. The Testicles and their Coverings.
   G. The Female Urethra and Reproductive Organs.
      The vulva; the vagina; the uterus.
II. Uranalysis.
   1. Ordinary procedures.
   2. Functional tests (induced diuresis).

3. The hydruric coefficient; the azotemic coefficient (Ambard's coefficient); ureometry; chlorine balance.
4. Tests of renal permeability.

The volume dealing with the analyses of symptoms is much more comprehensive than Volume I. In this volume, various symptoms are taken up in alphabetical order and the causative factors of each are carefully considered. Taking dyspnea as an example, the condition is at first described together with its varying degrees of severity. It is then considered from the viewpoint of origin—that is, respiratory, cardiac, toxic or neuropathic,

The work is fully illustrated, and for the most part these illustrations are very good. However, the pictures of various pathological blood conditions are poor, and Fig. 443, appearing on page 533, would lead one to believe that the causative organism of syphilis could be found in a blood film prepared by ordinary methods.

GEORGE F. LULL.

THE BACTERIOPHAGE, ITS ROLE IN IMMUNITY, by F. d'Herelle, Pasteur Institute. English edition. Authorized translation by George H. Smith, Ph.D., Assistant Professor of Bacteriology and Pathology, Yale University School of Medicine. Fourteen text illustrations. Baltimore: Williams and Wilkins Company, 1922. Price, $4.00.

This English edition is more than a simple translation of the author's book on the same subject which appeared in France in 1921. The bibliography has been extended and much new experimental evidence introduced. The work is a correlation of the numerous notes and communications published by the author since 1917, together with a discussion of the work and opinions of others. It is a timely volume, in view of the extensive literature which has grown up about the subject.

D'Herelle observed that the filtrate of the stools of a patient suffering from dysentery, when added to a young broth culture of the dysentery bacillus, caused lysis of the culture, which became clear and transparent. Furthermore, small quantities of a culture lysed in this manner were in turn able to lyse other cultures, and so on indefinitely. This, essentially, is the phenomenon of "bacteriophagy," and although it had been described previously by other observers, credit is due to d'Herelle for stimulating general interest in it. The author was at first of the opinion that the lysis of the bacteria was due to an enzymatic action of some sort, but this he abandoned as being untenable. The present work is an eloquent defense of the theory that the bacteriophage is a living ultramicroscopic organism, able to reproduce itself and parasitic upon bacteria in much the same manner that bacteria are parasitic upon higher forms of life.

Experiments which convince the author of the living nature of the bacteriophage are given in detail, followed by a discussion of the views of Bordet and others, who do not believe that the phenomenon is due to an ultramicroscopic organism. The author says that an exactly similar discussion prevailed at one time in regard to the nature of putrefaction, until Pasteur definitely demonstrated that putrefaction was due to living microorganisms.

The latter part of the book is given over to a discussion of the possible rôle of this agent in immunity. "Multicellular organisms have profited by securing for their defense the parasitism of the bacteriophage for the bacteria." The evidence here is not entirely complete, but it is of the most stimulating character, and it is seen that the subject is full of possibilities.

The entire work is exceedingly well written and constitutes very easy reading. No one interested in bacteriology or in the problems of immunity should forego an acquaintance with this book.

JOHN E. WALKER.

89

THE
MILITARY SURGEON

VOL. 53 AUGUST, 1923 NUMBER 2

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE ARMY MEDICAL MUSEUM, WASHINGTON, D. C.

BY DR. D. S. LAMB

ON APRIL 25, 1862, Dr. William A. Hammond, then an Assistant Surgeon, was appointed Surgeon General, U. S. Army.

At that time, there were in the private office of the Surgeon General a few preparations of human anatomy, which had long been there, or in the adjoining library room. The collection comprised several human crania, a skeleton, two wax injections demonstrating the vascular system and made by Dr. C. S. Tripler, Surgeon, U. S. A., a wax injection made by Dr. N. R. Moseley, Surgeon, U. S. V., and a few plaster casts and drawings.

Dr. John H. Brinton, Brigade Surgeon, U. S. Vols., the first Curator of the Museum, in his address to the Army Medical School, March 13, 1896 (see Journal American Medical Association, March 28, 1896), said that "The beginning of the Museum in August, 1862, was very modest, consisting of three dried and varnished specimens placed on a little shelf above the inkstand on the desk of the recently appointed Curator.

On May 19, 1862, Dr. J. J. Woodward, Asst. Surg., U. S. A., was assigned to duty in the Surgeon General's Office. General Hammond in less than one month after his appointment issued the following circular:

SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., *May* 21, 1862.

Circular No. 2.

As it is proposed to establish in Washington an *Army Medical Museum*, Medical Officers are directed diligently to collect and to forward to the Office of the Surgeon General all specimens of morbid anatomy, surgical or medical, which may be regarded as valuable; together with projectiles and foreign bodies removed; and such other matter as may prove of interest in the study of military medicine and surgery. These objects should be accompanied by short explanatory notes. Each specimen in the collection will have appended the name of the medical officer by whom it was prepared.

On June 4, Dr. Brinton was assigned to special duty in the Surgeon

General's Office. The specimens so far collected were placed in his charge and he was appointed Curator. On June 9, the Surgeon General issued the following:

SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., *June* 9, 1862.

Circular No. 5.

It is intended to prepare for publication the Medical and Surgical History of the Rebellion.

The Medical portion of this work has been committed to Assistant Surgeon J. J. Woodward, United States Army, and the Surgical part to Brigade Surgeon John H. Brinton, United States Volunteers.

Not only, however, were these officers charged with the preparation of the history, as stated, but they were given charge of the museum collections and were also required to attend to many other important matters. From that time till now, the army medical officers on duty at the Museum, besides their museum work, have had a great variety of other duties to perform.

In 1878, Dr. Otis, in the *Boston Medical and Surgical Journal*, Vol. 98, p. 163, stated that the Museum was primarily instituted to collect and preserve specimens illustrating injuries and diseases that cause death and disability during war. In the preparation for the exhibit at the New Orleans Exposition of 1884-5, the following memorandum, presumably by Dr. J. S. Billings, U. S. A., was made:

The principal object in creating the Army Medical Museum during the early part of the war was to preserve specimens illustrative of the wounds and diseases which cause death and disability in war, and thereby facilitate the study of methods to diminish mortality and suffering among soldiers. Gradually the scope of the collection was extended to include all forms of injuries and diseases so as to form a general pathological Museum.

Naturally, specimens of human and comparative anatomy were soon found not only useful but necessary additions to the original collection, and a cabinet of microscopical preparations of original research was accumulated; and it is now desired to make these sections as complete as possible.

An interesting pathological cabinet collected chiefly by the labor of Professors Miller, Stone and Lincoln of the National Medical College, Washington, D. C., was obtained in exchange for a series of pictures and models for class demonstration that had been prepared when the project for the establishment of an Army Medical School had been contemplated. The cabinet of the late Dr. William Gibson of the University of Pennsylvania, comprising 529 specimens, was purchased.

On July 24 a contract was made between Surgeon General Hammond and Frederick Schafhirt, for duty in the Army Medical Museum. Dr. Otis in a letter to the Surgeon General, July 23, 1870, stated that Dr.

Schafhirt[1] began to collect specimens in August, 1861, but this should be 1862. Dr. Woodward, in a letter of October 28, 1880, said that Fred. Schafhirt was enlisted as a Hospital Steward, U. S. A., December 31, 1862; was assigned to duty at the Army Medical Museum, where he served until his term of enlistment expired, December 31, 1865. Then he was made Acting Assistant Surgeon, U. S. A., and again assigned to the Museum, serving until July 1, 1874, when his contract was annulled and he was appointed Anatomist and held this position till he died, October 18, 1880. During this time his duty was to prepare bone specimens, and he did the work satisfactorily. Dr. Woodward, perhaps inadvertently, omitted to mention Schafhirt's service before December 31, 1862.

Dr. Brinton, in his address to the graduates of the Army Medical School, March 13, 1896 (*supra*) says:

The preparer of the bones, Frederick Schafhirt, who under the unpretentious name of Hospital Steward, had been procured from the University of Pennsylvania, where he had long labored as an assistant to the immortal Leidy, was overworked. And here let me pay my tribute of respect to the memory of one who at this time did so much for the Museum, and without whom, perhaps, the collection had not taken shape.

The following is from the address of Dr. William Hunt, November 17, 1891, on Dr. Joseph Leidy, published by Collins, Philadelphia, 1892, p. 16:

Two rooms on the second floor of the old University (of Pennsylvania) with a passageway leading to the Museum, the lecture and dissecting rooms, were the seat of Dr. Leidy's labors, on Ninth Street. In a corner of the passageway near the window were Fred. Schafhirt's tables, where he dissected and prepared reptiles, birds and mammals, and ate Schweitzer and drank schnapps, and sung German sentimental and patriotic songs. In a room adjoining was Leidy, maybe dissecting a subject.

On July 28 the Surgeon General sent a number of medical officers to various hospitals to obtain from the surgeon in charge of each hospital such specimens of morbid anatomy (both medical and surgical) as had accumulated since the establishment of the hospital, or were in the possession of any of the medical officers of the hospital, and to have them packed and forwarded to the Surgeon General's Office.

Dr. Brinton in his "Personal Memoirs," New York, 1914, p. 180, quotes the following:

SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., *August* 1, 1862.

SIR:

You are hereby directed to collect and properly arrange in the

[1] Schafhirt was not a graduate in medicine, but was called "Doctor."

"Military Medical Museum" all specimens of morbid anatomy, both medical and surgical, which have accumulated since the commencement of the Rebellion in the various U. S. Hospitals, or which may have been retained by any of the Medical Officers of the Army. You will also take efficient measures for the procuring hereafter of all speciments of surgical and medical interest that shall be afforded in the practice of the different hospitals. Should any Medical Officer of the Army decline or neglect to furnish such preparations for the Museum you will report the name of such officer to this office.

Very respty. Yr. Obdt. Servt.

WILLIAM A. HAMMOND,
Surgeon General.

DR. BRINTON, *Surgeon, U. S. Vols.*"

On page 181 of his "Memoirs," Dr. Brinton says further:

The first idea of an "Army Medical Museum" originated with Surgeon General Hammond, and was by him communicated to the Officers of the Army in Circular No. 2, which I have given (*supra*). I told him when I first saw him that I had collected a good many bone specimens in the West, some of which I had lost, and some of which I brought home (now in my collection of gun-shot wounds of bone). The order of August 1 to me was the first step towards really putting this notion of an Army Museum into shape, and was a most welcome duty. My whole heart was in the Museum, and I felt that if the medical officers in the field, and those in charge of hospitals, could only be fairly interested, its growth would be rapid, and the future good of such a grand national cabinet would be immense. By it the results of the surgery of this war would be preserved for all time, and the education of future generations of military surgeons would be greatly assisted.

To help me in my work Hospital Steward Frederic Schafhirt and his son, Adolph, were assigned to duty with me. The elder Schafhirt was an admirable bone cleaner and working anatomist. He had for a long time worked at the University of Pennsylvania under Dr. Leidy (Dr. Joseph Leidy, Professor of Anatomy) and was an adept in preparing and mounting specimens for a Museum. We at once went to work. I obtained for him amputated arms and legs from the Washington hospitals, and afterwards from those in the neighborhood; these he cleaned, prepared and mounted, and very soon the first specimens, the initial preparations of our new Museum, were ready, and made their official appearance on top of my desk, and on the shelves put up for the purpose in my rooms in the Surgeon General's Office, at first down stairs, and afterwards in the second story room of the office on Pennsylvania Avenue, looking towards Riggs' Bank. This room I afterwards relinquished to Medical Inspector General Perley, and was moved with my Museum possessions into one or two of the small rooms of a second story back building on Pennsylvania Avenue, below the War Department, where quarters were assigned to Dr. Woodward and myself, then actually pushing on our medical and surgical histories of the war, and compiling our reports of sick and wounded, a work demanding the services of many clerks.

The first building named above was really a part of the former Riggs' Bank building, being the part above and back of that occupied by the bank itself. A new building has since been erected. The second building named above was then known as 180 Pennsylvania Avenue, west of 17th Street, north side. The building is still standing, with a new number, 1719–21.

Dr. H. E. Brown, Asst. Surgeon, U. S. A., in his "The Medical Department of the U. S. Army," 1873, page 225, says that:

Very soon after his appointment, Surgeon General Hammond saw the great advantage that would accrue to the cause of scientific medicine and surgery by rendering the enormous experience of the war available for future study. Hardly ever in the history of the world had such an opportunity been offered for the collection of statistics upon all points of military medicine, surgery and hygiene, and of obtaining specimens illustrative of pathological anatomy. It was therefore determined to commence such a collection in Washington, and the initiatory steps were taken by the promulgation of the following Circular" (namely, Circular No. 2, 1862, *supra*).

Dr. Charles J. Stillè, in his History of the Sanitary Commission, 1866, page 449, says:

He (Surgeon General Hammond) instituted at Washington an Army Medical Museum in which was collected and arranged a vast number of specimens from the different hospitals, illustrating the nature of the peculiar disorders to which soldiers are liable, and the character of the wounds which are inflicted by the new missiles of war.

On August 28, Dr. Brinton sent to Muzzy & Monroe of Philadelphia what appears to be the first order on record of the purchase of glass jars for mounting specimens for the Museum. They were to have round glass stoppers with glass hook, the neck of the jar and stopper to to be ground; no flange at the base; the mouth of the jar to be of the greatest possible width. Brinton used the expression "Military Medical Museum."

From Brinton's "Memoirs," page 203, is quoted the following:

WASHINGTON, D. C.,
September 18, 1862.

SIR:

You will proceed without delay to Frederick, Md., to superintend the selection (collection?) of specimens for the Pathological Museum connected with this office. All Medical Officers are hereby ordered to give you any aid in their power to further this object.

Very respectfully, yr. obt. Servt.

By order of the Surgeon General.
(Signed) JOS. R. SMITH,
Surgeon, U. S. A.

DR. BRINTON, *Surgeon of Volunteers, etc.*

Somewhere about this time, Dr. William Moss, who had been appointed Asst. Surgeon, U. S. Vols., October 4, 1862, was ordered to duty at the Museum. His name appears in the record December 4.

On December 11, Dr. W. W. Keen of Philadelphia, Acting Asst. Surgeon, U. S. A., who was on duty at the Military Hospital at Frederick, Md., was directed to collect specimens and forward them in barrels to the Surgeon General's Office. He was authorized to buy whiskey for use as preservative.

Dr. Brinton went to Fredericksburg in December, 1862, after the battle. He says (Memoirs, page 214):

My duty at Fredericksburg at this time was to help in every way those who were caring for the wounded and at the same time to look after the interests of the Museum. Dr. Moss who was then Assistant Curator of the Museum had accompanied me, and was very busy gathering up specimens to be taken up to Washington for preparation and preservation. . . . On the afternoon of the 15th I encountered Dr. Moss, my assistant, bringing with him an immense number of surgical specimens, some of these in boxes which we sneaked over in the wagons; the remainder were carried in great bags on the backs of one or two very black negroes (page 220).

I returned to Washington about the 19th of December, and was immediately at my old work. Specimens were now accumulating at the Museum. Very soon after my arrival I sent Dr. Moss down to the Army for more. By this time the Surgeons generally were becoming interested in the Museum project and were taking pains to get and preserve what they could for the collection (page 222).

On December 31, the contract of Dr. Schafhirt was annulled and he was enlisted as Hospital Steward, U. S. A.

The following was published January, 1863: "Catalogue of the Army Medical Museum, Surgeon General's Office, January 1, 1863, 8vo., pp. 58, Washington, Government Printing Office." It contained the following introductory letter by Dr. Brinton, the Curator, dated January 10, addressed to Surgeon General Hammond. The collection consisted of 985 surgical specimens, 106 medical, 133 missiles, and 125 miscellaneous; total, 1,349.

ARMY MEDICAL MUSEUM

SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., *January* 10, 1863.

GENERAL: In obedience to your order of December 15, 1862, I have the honor to submit the following report of the condition of the Army Medical Museum on January 1, 1863:

This Museum was established, in pursuance of your orders, in the month of August last. All of the contained specimens have been

collected since that time, and their number is being daily augmented.

The collection at present consists of thirteen hundred and forty-nine objects. Of these, nine hundred and eighty-five are surgical specimens, one hundred and six are medical, and one hundred and thirty-three are missiles, which, for the most part, have been extracted from the body. This latter class includes round and conical bullets, shot, grape, canister, fragments of shell, arrows, arrow-heads, etc. Not the least interesting portion of the cabinet is a series of projectiles for small arms, field and heavy guns; and also a complete set of the bayonets now in use in our own and foreign services. For this valuable collection, prepared at the Washington arsenal, under the supervision of Lieut. Col. Geo. D. Ramsay, U. S. A., the Museum is indebted to the Ordnance Department of the Army.

Every object in the Museum has been appropriately and permanently mounted—the dried preparations on stands and the wet ones in glass anatomical jars, of the most approved patterns, and constructed for the purpose. Every specimen bears a label on which is inscribed its Catalogue number and the name and rank of the medical officer from whom received.

In the accompanying Catalogue—prepared by Assistant Surgeon William Moss, U. S. V., Assistant Curator of the collection, the museum number of every object is given, and its character is briefly described. The name of the medical officer contributing it will be found on the same line in a separate column.

As the value of all pathological preparations depends, to a great extent, upon the completeness of their history, strenuous efforts have been made to procure an accurate surgical and medical account of every case from which a specimen has been taken. I regret to state that, in many instances, the desired success has not been obtained. In order that this evil may, as far as possible, be remedied, the number of every specimen in the Catalogue for which a sufficient history has been received has been marked with an asterisk. For all others, neither history nor description have as yet been furnished. It is hoped that medical officers, recognizing the objects contributed by them, will exert themselves at once to remedy this deficiency.

In presenting to you, General, this catalogue, you will please remember that it is offered simply as a numerical list of the objects in the Army Medical Museum. No attempt has as yet been made to classify the various injuries, nor has any description of the preparations been entered upon. Such a work must be deferred for the future. It will then be found to demand volumes. The labor of the present hour is simply to collect and to preserve, the study must be made hereafter.

I have the honor to be,

Very respectfully, your obedient servant,

JOHN H. BRINTON,
Surgeon, U. S. V., and Curator Army Medical Museum.

Brigadier General William A. Hammond,
Surgeon General, U. S. A.

SUGGESTIONS TO THE MEDICAL OFFICERS OF THE ARMY, AS TO THE PREPARATION AND FORWARDING OF SPECIMENS TO THE ARMY MEDICAL MUSEUM, SURGEON GENERAL'S OFFICE, WASHINGTON, D. C.

The objects which the Surgeon General desires to collect for the Museum may be thus enumerated:

1. *Specimens illustrative of surgical injuries and affections;* such as—

Fractures, compound and simple-fractures of the cranium.

Excised portions of bone.

Diseased bones and joints.

Exfoliations, especially those occurring in stumps.

Specimens illustrative of the structure of stumps, (obliterated arteries, bulbous nerves, rounded bones, etc.).

Integumental wounds of entrance and of exit, from both the round and conoidal ball.

Wounds of vessels and nerves.

Vessels obtained subsequent to ligation and to secondary hemorrhage.

Wounded viscera.

Photographic representations of extraordinary injuries, portraying the results of injuries, operations, or peculiar amputations.

Models of novel surgical appliances, and photographic views of new plans of dressing.

2. *Specimens of disease.*

Specimens illustrating morbid processes of every kind; especial consideration being paid, however, to the degree in which the morbid condition will probably be demonstrable in the preparation when preserved. All unnecessary or extraneous appendages to be dissected away. In addition to specimens of diseased organs, malformations, parasites, concretions, and calculi are desirable. Microscopical specimens should, for uniformity sake, be mounted on slips of glass 3 inches by 1 inch.

It is not intended to impose on medical officers the labor of dissecting and preparing the specimens they may contribute to the Museum. This will be done under the superintendence of the Curator.

In forwarding such pathological objects as compound fractures, bony specimens, and wet preparations generally, obtained after amputation, operation, or cadaveric examination, all unnecessary soft parts should first be roughly removed. Every specimen should then be wrapped separately in a cloth, so as to preserve all spicula and fragments. A small block of wood should be attached, with the number of the specimen and the name of the medical officer sending it inscribed, in lead pencil; or a strip of sheet-lead, properly marked with the point of an awl, may be employed for this purpose. In either case, the inscription will be uninjured by the contact of fluids. The preparation should then be immersed in diluted alcohol or whiskey, contained in a keg or small cask. When a sufficient number of objects shall have accumulated, the cask should be forwarded directly to the Surgeon General's Office. The expenses of expressage will be defrayed in Washington. The receipt of the keg or package will be duly acknowledged by the Curator of the Museum.

In every instance, a corresponding list or history of the cases should, at the same time, be forwarded to this office by mail. In this list the number and nature of every specimen should be clearly specified, and, when possible, its history should be given. The numbers attached to the specimens themselves, and the numbers in the list forwarded, should always correspond, and should be accompanied by the name and rank of the medical officer by whom sent. Every specimen will be duly credited in the Catalogue to the medical officer contributing it.

Much confusion has hitherto arisen from the fact that considerable periods of time have often been allowed to elapse between the sending of the specimen and the forwarding of its history. In many cases no history whatever has been received. It is hoped that it is not yet too late to remedy this deficiency.

If any errors exist in the present Catalogue, they will be corrected on due notification being sent to the Curator.

The following medical officers have been authorized by the Surgeon General to collect and forward specimens to the Museum from the cities and localities in which they are respectively stationed:

Surgeon Lavington Quick, U.S.V., Baltimore.
Acting Assistant Surgeon Edward Hartshorne, U.S.A., Philadelphia.
Acting Assistant Surgeon George Shrady, U.S.A., New York.
Surgeon M. Goldsmith, U.S.V., Louisville.
Surgeon J. F. Carpenter, U.S.V., Cincinnati.
Assistant Surgeon F. L. Town, U.S.A., Nashville.
Surgeon John S. Hodgen, U.S.V., St. Louis.
Surgeon H. S. Hewit, U.S.V., Army of the Mississippi.

Dr. Brinton in his "Memoirs," page 188, says of the catalogue of 1863, that "its real object was to give credit to Medical Officers contributing to the Museum. In fact it did a great deal more; large numbers of preparations had accumulated in the Museum, the donors of which were not known. Very many of the specimens I had brought there from the battlefields, collected by myself. These I put in the first catalogue, assigning them to such medical officers as I could call to mind, and especially to those whom I knew to be lukewarm in museum interests. The effect of the procedure was good."

Again (page 187) he says that the publication of the first catalogue in January, 1863, had a good effect, as also did the opening of the Museum to the public.[3] He adds: "Many and many a putrid heap have I dug out of the trenches where they had been buried." On page 185 he says that the bones of the parts removed by amputation were usually partly cleaned and then with a wooden tag and carved number attached were packed in a keg containing alcohol, whiskey or sometimes

[3]The Museum was opened to the public about September, 1863.

salt and water. When a number of specimens were thus ready the keg was sent to the Museum, where the preparation was completed and the specimens placed on the shelves. In the meantime the histories were sent to the Surgeon General.

On January 27, 1863, by order of Dr. Brinton, five barrels of whiskey were furnished to Dr. Keen at Frederick, Maryland, by J. B. Eppler, of Frederick, for preservation of specimens.

On February 26, Dr. Brinton wrote to Surgeon C. H. Laub, U.S.A., Medical Director, Department of Tennessee, asking that in case of action he would detail some young "sawbones" or a medical cadet to collect amputated limbs, etc., for the Museum; thrown into a barrel with a little whiskey and forwarded to the Surgeon General's Office, they would form a valuable contribution to the Museum.

On February 27, a lot of drugs were donated to the Museum by the chemists, Wyeth & Bro., Philadelphia.

On March 28 Dr. Robert Murray, Surgeon, U.S.A., and Medical Purveyor at Philadelphia, sent two barrels of alcohol to the Museum.

On April 27 A. J. Schafhirt, Hospital Steward, U.S.A., then on duty at the Museum, as stated above, was ordered to report for special duty to B. A. Vanderkieft, Surgeon, U. S. Vols., at the General Hospital, Smoketown, Maryland, and after performing the required duty to return to the Museum. The order was signed by Joseph Smith, Surgeon, U.S.A., for the Surgeon General.

Brinton in his "Memoirs," page 231, says:

So on the 5th of May I left with my hospital stewards. Stauch was a German water-color painter. He had enlisted, tempted by the bounty, or to avoid the draft, and had immediately been detailed on this special duty as water colorist at the Surgeon General's Office. Schafhirt was the bone artist, the son of Schafhirt who prepared the specimens at the Museum, and who had originally been an assistant or workman in the dissecting room of the University of Pennsylvania. Stauch's duty was to paint sketches of such wounds and injuries as I might indicate, while Schafhirt was to assist me in the collection of specimens for the Army Museum, that is, to bring away the bones fractured by gunshot or cannon projectiles, mostly obtained from the amputated limbs, which accumulated at the operating tables, in the various hospitals, division, corps, or field, which I might visit.

At first I had experienced much difficulty in obtaining the necessary permission from surgeons, but by this time they had become interested, and were anxious to furnish all they could to the national collection. As the preparations were finished, or rather the limbs, etc., I had them roughly cleaned (most often I was obliged to do this myself) and then I had them placed in barrels with liquor and so sent or took them with me to Washington.

On May 21, the following order was issued:

SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., *May* 21, 1863.

SIR:

You will proceed immediately to the Army of the Potomac and visit the different corps hospitals, on special duty connected with the collection of pathological specimens. Having accomplished this you will return to this city and resume your present duties.

By order of the Surgeon General,
(Signed) JOSEPH R. SMITH,
Surgeon, U.S.A.

To Surg. J. H. Brinton, U.S.V.,
Washington, D. C.

The museum collection having outgrown the space allotted to it at 180 Pennsylvania Avenue, it became necessary to secure more suitable quarters, and the Corcoran Schoolhouse was selected. This building was situated at what is now 1325 H St. N.W.; the old building was torn down some years since and the present one erected, which is used by the George Washington Medical School. The following orders were issued, respectively one by the Commandant of the Military District, the other by the Surgeon General:

Special Order
No. 116.

HDQRS. MILT. DIST. OF WASHINGTON,
WASHINGTON, D. C., *May* 22, 1863.

(Extract) II.

The school house situated on H Street North, between 13th and 14th Streets, owned by Mr. Corcoran, is hereby taken possession of by the Government of the United States, and turned over to the Medical Department for the use of the Army Medical Museum.

By command of Major General Hitchcock,
JOHN J. SHERBURNE,
Asst. Adjt. General.

To Surgeon General Hammond.

SURGEON GENERAL'S OFFICE,
WASHINGTON CITY, *June* 1, 1863.

SIR:

The building known as Corcoran's school house near (opposite) Dr. Gurley's Church, together with its outbuildings thereto, having been turned over to this Department by order of the Secretary of War, you will take charge thereof, and make such alterations and repairs as may be necessary to fit it for the purpose of the Army Medical Museum. You will, however, avoid all useless alterations or expenses.

Very respectfully, yr. obdt. Servt.
JOSEPH R. SMITH,
Acting Surgeon General.

To Surgeon J. H. Brinton,
Surgeon General's Office,
Washington, D. C.

On June 2, Dr. Brinton wrote to a Mr. Vollmer, Philadelphia, in regard to making upright cases for the Museum, suggesting that they be made of black walnut unvarnished. Apparently no order was given, because walnut cases were not sent. On June 9, however, Henry Wingate, of Washington, was contracted with to make sixteen cases.

Dr. Brinton went to Gettysburg after the battle, partly to secure specimens for the Museum. He says ("Memoirs," page 246) that he was able to gather much for the Museum, and for the most part the medical officers were anxious to further him in his endeavors to carry out his Washington instructions.

Surgeon General Hammond at this time had been detailed for other duty, although still holding the rank of Surgeon General.

On page 245 of his Memoirs Brinton says:

One of my men at Gettysburg took from the body of a Southern soldier a breastplate of soft steel in two halves intended to be worn under the coat or vest. One ball had struck it and indented or bent it without perforation. Another, if I remember rightly, had passed through in the region of the liver causing the death of the wearer. I think the breastplate bore the imprint "Ames Manufacturing Company." This cuirass was placed in the Army Medical Museum and I suppose is there now. It was the only example of offensive armor I met with during the war. (See specimen 4654, Path. Section; the right half, showing a hole that might correspond to the "region of the liver." Also on the lower edge another smaller hole. The whereabouts of the other half is not known.)

Brinton, in his address to the Army Medical School graduates, says that in July, 1863, an amputated leg was received at the Museum, in an extemporized coffin on which was tacked a visiting card "with the compliments of Major General D. E. S. (Sickles), U. S. Volunteers." (The bones were prepared, show the shot fracture, and are numbered 1335 Path. Section.)

General Hammond in his Report for 1862–3, to the Secretary of War, says:

Considerable progress has been made in the establishment of an Army Medical Museum. The advantages to the service and to science from such an institution cannot be overestimated. I respectfully recommend that a small annual appropriation be made for its benefit.

On July 7, the Corcoran school house, which Brinton (Memoirs, page 182) says had been previously fitted up for a picture gallery, was turned over to the Medical Department by the military authorities. He wrote to the Trustees of the Public School informing them that the building had been turned over to the Medical Department of the Army and asked them to have the furniture belonging to the school removed as soon as possible.

The following letter was addressed by Dr. Brinton, August 4, to Col. J. K. Barnes, Medical Inspector General, and Acting Surgeon General, U.S.A.:

COLONEL:

In reply to your inquiries relative to the Army Medical Museum I have the honor to state: That the formation of the collection now known as the Army Medical Museum was commenced in the Fall (should be Summer) of 1862, when the cooperation of the medical officers of the Army was invited to this end. The greatest interest has since then been evinced by the medical staff in the undertaking, and pathological specimens have been continuously forwarded to the Museum from every quarter. On the first of January the cabinet had already obtained considerable size, and at the present moment it is nearly double what it then was. The number of specimens all told is now probably not less than 3,500. The collection of gunshot injuries alone is the largest in the world, exceeding in number and value that of the British Government at Netley (formerly at Fort Pitt, Chatham), and far surpassing the French Museum at Val-de-Grace, founded by Baron Larrey.

It is unnecessary for me, Colonel, to urge upon you the value of our National Medical Museum. Its claims to usefulness are recognized by the civil profession throughout the country and it is by them weekly and almost daily considered. The cabinet as it stands is not a mere museum of curiosities. It is a collection which teaches. It is practical and has already powerfully influenced for the better the treatment of the wounded soldier. In confirmation of this assertion I would simply recall to your mind the lessons to be deduced from the study of the specimens on its shelves, of injuries of the joints from conoidal balls; a class of injuries previously almost unknown and the treatment of which, at the commencement of the war, was unsettled.

During the last session a small appropriation ($5,000.00) was made for the support of the Museum. At that time the collection had exceeded the limits of the room appropriated for its accommodation, and the specimens had commenced to suffer from dust. I was therefore instructed to find and rent a proper building for their reception. After long search, I could find none suitable save the building in H Street owned by Mr. Corcoran. I proposed to rent it from his agent, Mr. Hyde, who after communicating with the owner informed me that Mr. Corcoran would be willing to rent the building to the Museum for $1,000 per annum, he agreeing to put it in repair. This proposition was accepted on the part of the Museum, and on the 16th of May, last, permission was requested by the Surgeon General from the Secretary of War, to rent the building, the rent to be paid out of the Museum appropriation. The renting of the premises was however forbidden by the Secretary, who on the 21st of May ordered the building in question to be turned over by the Military Governor to the Medical Department for the purposes specified, directing moreover that "no rent will be paid for the building."

The public school at the time occupying the hall was in nowise interfered with and the real possession of the house was not obtained

until after the close of the school session. Since that time the building has been put in complete order and the cases erected at a cost to the Museum of nearly $2,000. It is now ready for the reception of the collection. The proposed arrangements are such as will open the collection to the study of every surgeon, both military and civil. Thus only can a true knowledge of the treatment of wounds produced by modern projectiles be diffused. In conclusion, Colonel, I would draw your attention to the serious detriment which would accrue to the Museum and to the great pecuniary loss it would sustain should any change in the proposed plan be ordered. I know of no other suitable building for the purposes of the Museum, and even should one be found, the fund at command would be utterly insufficient to make a second time the alterations and repairs which would be absolutely necessary.

—Signed by J. H. Brinton, as Surgeon of Vols., and Curator of the Museum.

The following is from Brinton's "Memoirs," page 185:

WAR DEPARTMENT, WASHINGTON CITY,
September 1, 1863.

Copy

COL. J. K. BARNES,
Medical Inspector General,
Washington, D. C.

The Secretary of War authorizes the transfer of the specimens from the room of the Surgeon General's Office to the Museum newly selected.

Very respectfully, yr. Obdt. Servt.
(Signed) JAS. A. HARDIE,
Asst. Adjt. Genl.

From the above it will be seen that the Museum specimens remained at the office of the Surgeon General under my immediate care (except Medical specimens proper, under Asst. Surgeon Woodward's care) from the inception of the Museum. I removed them to the Corcoran building, and was responsible for them and for the growth of the Museum during my stay in Washington.

Schafhirt and his son, who prepared the specimens, were borne on the Surgeon General's roster of employees as hospital stewards, while soldiers and men from the Invalid Corps were detached as servants and additional helpers and orderlies. In the meantime, with the funds appropriated, I was enabled, under the instructions of the Surgeon General, to fit up good cases for the rapidly growing collection. The doors locked with bronze hands which slid bolts at top and bottom, modeled after the hands in the cases of my home office. . . . These cases were gradually extended until, before I left Washington in October, 1864, galleries had been erected and the room or hall completely filled.

One of the first additions to the Museum was an Assistant Curator, I being then also officially Curator, who should superintend the work on the specimens, and the recording of their histories, which was diligently done by clerks appointed from the Surgeon General's Office. Dr. Wm. Moss who had entered the Corps of Surgeons of Volunteers, was the first Assistant Curator, and on his resignation from the Army, after his marriage, he was succeeded by my old student, Dr. Brinton Stone, who had become an Assistant Surgeon.

For a full description of how specimens were obtained and other matters connected with the Museum see Brinton's Memoirs, pp. 185 to 194.

On September 11, Brinton made requisition for articles for the Museum, including two iron bedsteads, two mattresses and four blankets. What these were for does not appear. There was no watchman at that time.

On September 15, in a letter to Asst. Surgeon General C. H. Crane. Brinton reports that the Museum was then located in a building known formerly as the Corcoran Schoolhouse and was under his immediate superintendence. The specimens, the largest collection of gunshot wounds in the world, admirably mounted. A thorough system had been established for collecting specimens from the different armies and hospitals. One hospital steward (Schafhirt) had been detailed for duty in preparing the specimens. Brinton was daily expecting another one. One hospital steward acted as copying clerk for the histories of the specimens. Brinton asked for a medical officer who could undertake partial care of the Museum, assuming the duties then discharged by Asst. Surgeon Moss, U.S.V., who intended to resign, but had deferred his resignation until the necessary arrangement of the collection in the new building.

On September 15 a series of microscopical slides was bought from Prof. Hyrtl of Vienna.

On September 19, Dr. Moss resigned from the Army, and his connection with the Museum ended.

The following letter was addressed to Acting Surgeon General Barnes, September 24, 1863:

SIR:

The undersigned medical officers now on duty in this city and some of them connected with the Army Medical Museum, wishing to make that institution at once practically useful, request permission to deliver a course of lectures on military medicine and surgery in the hall of the Museum.

The large number of medical cadets and junior medical officers on duty in the various hospitals of this district at once suggests the advantage of such a course.

The lectures, if delivered in the evening, as proposed, would in no way interfere with the official duties of any one concerned. The subscribers have all formerly had more or less experience in lecturing on medical subjects and they therefore entertain the hope that their efforts would not be without beneficial effect for those especially who aspire to the position of medical officers in either the regular or volunteer service.

These lectures of course will be delivered free, and with the facilities offered by the Museum would not be a source of any expense whatever to the Government.

The names signed are J. H. Brinton, Surgeon, U.S.V., R. Bartholow, Asst. Surgeon, U.S.A., J. J. Woodward, Asst. Surgeon, U.S.A., and D. W. Bliss, Surgeon, U.S.V.

Brinton (Memoirs, pages 258–259) says that he fitted up the room beneath the main hall of the Museum in the Corcoran building for teaching purposes, that is, for an Army Medical School.

There was a charming lecture room with sloping seats, a couple of convenient retiring rooms or laboratories, a good stage to speak from and a well constructed lecture and revolving table. The illustrations in lavish profusion were in the main hall above and everything was ready for the first military-medical course of the United States Army for the session 1863–64. It wanted but the authorization of the scheme by the Secretary of War and the appointment of the lecturers or professors. These had in truth been selected. There was Coolidge of the regular army, an old officer, to teach the customs of the service and military-medical ethics. Surgeon Sidell (should be Lidell) U.S.V., as a teacher of chemical surgery (probably *clinical* surgery); Asst. Surgeon Wm. Thomson, since famous as an oculist; Asst. Surgeon J. J. Woodward, U.S.A., on military medicine; Robert Roberts Bartholow of world-wide reputation, and several others whose names have escaped me. Gunshot injuries had been assigned to me, and even my introductory remarks had been jotted down.

As Curator of the Museum, Brinton reported to Barnes the forward state of preparation.

The Secretary of War had to be informed. He was told by General Barnes and said he would decide the matter and speak of it tomorrow. On the morrow about nine o'clock on his drive from his home to the War Office, he stopped at the Museum building, descended from his carriage, ran hastily through the Museum rooms, stamped his foot, growled "Ugh," drove to his office, sent for Acting Surgeon General Barnes, and said sharply to him: "Are these lectures to be given in the evenings?" To an affirmative reply he growled: "They will go to the theatre and neglect their duties. It shan't be." And this was the end of a favorite plan for doing some good for the Medical Corps of the Army and for disseminating a more correct and general knowledge of Military Medicine and Surgery.

On the back of a duplicate letter appears the following program:

1863–64	7 p. m.	8 p. m.
Monday	Brinton	Bartholow
Tuesday	Woodward	Hamlin[4]
Wednesday	Brinton	Bartholow
Thursday	Woodward	Hamlin
Friday	Bliss	

[4] This must have been A. C. Hamlin, Surg., U. S. Vols. See also Brinton's address to the graduates of the Army Medical School, March 13, 1896, *Jour. Amer. Med. Assn.*, March 28, 1896, page 600.

On October 28, Dr. Ralph S. L. Walsh, Acting Asst. Surgeon, was assigned to duty at the Museum. In a letter to Dr. Lamb, published in the History of the Medical Society of the District of Columbia, 1909, page 270, Dr. Walsh said:

I may mention that during this period I was also placed in immediate charge of the Army Medical Museum, then located on H Street between 13th and 14th Streets. Said Museum, when I assumed charge, consisted of two large rooms filled with empty cases, a back building in which was stored a number of dry and moist specimens in barrels and alcohol, to be mounted by Mr. Schafhirt, who was employed for that purpose. There was also a mass of written histories, numbered to correspond with the specimens. Under my supervision the specimens were mounted, numbered and placed in the cases, and the histories condensed and recorded. . . . I mention as a possibly interesting fact that most of the alcohol used for the preservation of the moist specimens was procured by distillation of contraband liquors seized on the Long Bridge. These liquors ran from blackberry wine to straight alcohol, and were packed in many peculiar vessels. Frequently women were arrested with belts under their skirts to which were fastened tin sectional cans holding from a quart to a gallon, and in a number of cases false breasts, each holding a quart or more.

In view of the above statement of his services, by Dr. Walsh, presuming it to be correct, it is impossible to understand why he is not mentioned by Dr. Brinton, who mentions by name even the hospital stewards who did duty at the Museum. It will be noted that Dr. Moss had resigned September 19, and apparently there was no medical officer connected with the Museum from that time until the appointment of Brinton Stone, in 1864, except Drs. Brinton, Woodward and Walsh; and Brinton and Woodward had their offices at 180 Pennsylvania Avenue (see Brinton's letter of September 15).

On November 23 it was ordered that the liquor confiscated and turned over to the Medical Purveyor of the Army should be turned over by him to the "National" Medical Museum.

The following circular was issued November 25:

SURGEON GENERAL'S OFFICE,
WASHINGTON, D. C., *November* 25, 1863.

Circular No. 26.

The attention of Medical Officers in charge of U. S. A. General Hospitals is invited to the propriety of preparing and depositing in the Army Medical Museum illustrations of the result of surgical operations. These illustrations can in many instances be conveniently obtained by means of plaster casts which are readily made without subjecting the patient to the slightest inconvenience.

The casts most desired are those of stumps of amputations of every variety, and models of limbs upon which excisions may have been performed.

In selecting proper subjects for representation it would be well to choose not only those cases in which the results have been favorable but also those in which they have been unfavorable. In a collection like the National Museum truthful representations of both good and bad results are alike instructive and valuable for future reference and study.

These casts when made should be forwarded to the Army Medical Museum by express. The expressage will be paid in Washington. All preparations should be accompanied by proper histories with the rank and station of the contributor, who will be duly credited in the Museum catalogue.

Sometime in the winter of 1863–64 a Russian fleet visited the United States, and for awhile was anchored at Alexandria, Virginia, which seemed to be as far up the river as it could come. Dr. L. Holst, one of the surgeons of the fleet, visited the Museum. He published an account of his visit in Med. probav. k. morsk. sborniku, St. Peterb., 1865, V, page 49, abstracted and translated in the Würzburg med. schr. 1865, VI, pages 285 to 318. He was especially interested in the specimens of shot fracture and their sequelae. He did not think that the wet specimens were of much value, because the swelling, injection and color had been lost by the immersion in alcohol. The illustrations in preparation for the Medical and Surgical History of the War were, he thought, very natural looking. The microscopic slides were valuable. The Indian weapons were not the least interesting.

Besides the catalogue above mentioned, the following publications appeared in 1863, based more or less on the study of specimens in the Museum; all of them by Dr. Woodward:

"Hospital gangrene" (letter to Prof. Detmold), *Amer. Med. Times*, 1863, VI, 179.

"The Hospital Steward's Manual." Philadelphia; J. B. Lippincott & Co., 1863.

"Outlines of the chief camp diseases of the United States armies as observed during the present War." Philadelphia: J. B. Lippincott & Co., 1863.

In 1864, Dr. Brinton asked Acting Surgeon General Barnes to appoint Dr. Brinton Stone, Asst. Surgeon, U. S. A., to duty in the Museum, in place of Dr. Moss resigned, stating that Dr. Stone's knowledge of anatomical manipulations and his experience in the preparation of morbid specimens peculiarly fitted him for the position.

Dr. Woodward, in a letter to Rudolf Virchow, May 14, says in regard to the Microscopical Section of the Museum that, at first, except for what he himself did, which was but little because he had but little time, there was no one available who had enough experience in micro-pathological research. But at length he found a young man, Asst. Surgeon

Edward Curtis, U.S.A., who had some little preliminary knowledge as a microscopist, and who, working under Woodward's supervision, had become capable of independent investigation. He was patient and dextrous. So far, however, his work was mainly in normal anatomy. Woodward wanted to buy or have donated microscopical slides of normal and pathological anatomy, and wanted Virchow to interest himself in Germany to secure such slides.

Woodward stated briefly the methods in use at the Museum in making microscopical preparations. There was a limited group of cases in which boiled preparations, after soaking in turpentine, were mounted in balsam. He had used a varnish for cells of Brunswick black mixed with caoutchouc dissolved in benzole; the object of the caoutchouc was to prevent cracking. The stickiness of such a preparation was overcome by applying two coats of black sealing-wax varnish as a finish. One trouble was to get a preservative fluid that did not attack the varnish; especially specimens rendered transparent with acetic acid or otherwise, where it was necessary that the transparency should not be affected by the preservative fluid.

On June 24, a Circular Letter from the Surgeon General's Office, provided that:

Medical Officers in charge of hospitals are directed to diligently collect and preserve for the Army Medical Museum, all pathological surgical specimens which may occur in the hospitals under their charge.

The objects which it is desired to collect for the Museum may be thus enumerated: Fractures, common and simple, fractures of the cranium. Excised portions of bone. Diseased bones and joints. Exfoliations, especially those occurring in stumps. Specimens illustrative of the structure of stumps (obliterated arteries, bulbous nerves, rounded bones, etc.). Integumental wounds of entrance and of exit from both round and conoidal balls. Wounds of vessels and nerves. Vessels obtained subsequent to ligation, and to secondary hemorrhage. Wounded viscera. Photographic representations of extraordinary injuries portraying the results of wounds, operations or peculiar amputations. Models of novel surgical appliances and photographic views of new plans of dressing. Plaster casts of stumps and amputations and models of limbs on which excision may have been performed.

It is not intended to impose on medical officers the labor of dissecting and preparing the specimens they may contribute to the Museum. This will be done under the superintendence of the Curator.

In forwarding such pathological objects as compound fractures, bony specimens and wet preparations generally obtained after amputation, operation, or cadaveric examination, all unnecessary soft parts should first be roughly removed. Every specimen should then be wrapped separately in a cloth, so as to preserve all spicula and fragments. A small block of wood should be attached, with the name of the patient, the number of the specimen and the name of the medical

officer sending it, in pencil. The inscription will be uninjured by the contact of fluids. The preparation should be then immersed in diluted alcohol or whiskey contained in a keg or small cask. When a sufficient number of objects shall have accumulated, the cask should be forwarded directly to the Surgeon General's Office. The expenses of expressage will be defrayed in Washington. The receipt of the keg or package will be duly acknowledged by the Curator of the Museum.

In every instance a corresponding list or history of the cases should at the same time be forwarded to this office. In this list the number and nature of every specimen should be clearly specified and when possible its history should be given. The numbers attached to the specimens themselves and the numbers on the list forwarded should always correspond, and should be accompanied by the name and rank of the medical officer by whom sent. Every specimen will be duly credited in the Catalogue to the medical officer contributing it.

(Signed) J. K. Barnes,
Acting Surgeon General.

On July 22, Dr. George A. Otis, Asst. Surgeon, U. S. Vols., was ordered to duty in the Surgeon General's Office, and assigned as assistant to Dr. Brinton.

Brinton, "Memoirs," page 284, says that during July and August, 1864, he made one or two trips to New York and Philadelphia on business connected with the Art Department of the Museum. In the latter part of the summer, a Photographic Bureau was added to the Museum and he had to see to getting the outfit.

Brinton says also, page 285, that he had secured two artists at an earlier date: A. Pohlers, who had been on topographical duty in the War Department and who made the maps used in the Medical and Surgical History of the War. Another man, E. Stauch, went on duty in the latter part of 1862 or early in 1863. He went with Brinton several times to the Army of the Potomac and also to local hospitals to make sketches and pictures of hospital gangrene and other cases; he worked in both water and oil colors.

As indicating the friendly feeling of Dr. Woodward and also Surgeon General Barnes towards Dr. Brinton, Dr. W. W. Keen of Philadelphia wrote a letter in 1873 to Dr. Woodward, to which the latter replied June 12, 1873, as follows:

If there was any way in which I could help you to secure the object of your laudable ambition without acting in hostility to other friends it would certainly give me the greatest pleasure. I learn however that my old acquaintance Dr. Forbes and my former colleague, Dr. Brinton, are among the candidates. You will not, therefore, be surprised that I should desire to maintain neutrality and be unwilling to advocate any one candidate when I feel equally kindly towards others. I am under the impression that Dr. Barnes has already written a letter in favor of Dr. Brinton, and I doubt not that if you ask him he will forward a

statement of your record while connected with the Army, if you think that would be of use.

In January, 1865, the lower room of the museum building was floored and a large glazed case installed. A workshop for making plaster casts was fitted up in a back building and Hospital Steward Goulding was assigned to the duty of making them; afterwards this work was done by Hospital Steward Ernest Schafhirt.

In April, the photographer made 1,500 photographs of the assassins of President Lincoln to help the Department of Justice in the arrest.

July 1, in a report of Dr. G. A. Otis to the Surgeon General, he says:

In accordance with your order of October 3, 1864, I assumed charge of the property and financial affairs of the Museum at that date and the direction of the scientific operations of the surgical and photographical departments: the exclusive control of the medical and microscopical departments being assigned to Asst. Surgeon Woodward, U.S.A., by your order of October 6, 1864.

Early in November the large glazed cases in the upper hall were completed and the osteological specimens were placed in them, being classified according to regions. About two-fifths of the annual appropriation was paid to the contractor, H. Wingate, in accordance with the contract made by Surgeon Brinton.

About the same period a commodious photograph gallery was erected in the yard of the Museum by the Quartermaster's department, and supplied with water, baths, screens, shelving, etc. A few articles of furniture were procured from the Medical Purveyor. A sufficient amount of apparatus of high order of excellence, as is believed, was purchased from the museum fund at a cost of about $1,200.00. Hospital Steward Wills, U.S.A., formerly employed by the Topographical Bureau, was at first entrusted with the photographic work but subsequently a skilful photographer, Mr. Bell, was enlisted as a Hospital Steward and assigned to duty at the Museum as the principal photographer with Mr. Wills as an assistant. It is believed that the photographic work done at the Museum is creditable to the office. Over 50 of the more interesting specimens in the Museum have been represented, of imperial size, and about 40 complete sets of this series, that is about 1,000 large photographs, each accompanied with a history of the specimen, have been issued to the Medical Directors of the Armies and of Departments, and to eminent military surgeons abroad. These photographs have been much admired, and it is thought that the interest felt in the Museum has been augmented by their distribution. Small photographs to serve as a guide for the wood engravers have been executed to the number of 150, and an equal number of woodcuts have been prepared, illustrating gunshot injuries, means of transportation, etc., and suitable for intercalation in the text of an illustrated catalogue or publication relating to the surgery of the war. Photographs have likewise been made of ambulances, surgical apparatus and of a very large number of cases of interesting injuries, at the general hospitals. Lastly, during the month of April, 1865, there were printed 1,500

photographs of the assassins of the President, for the assistance of the officers of justice.

In January, 1865, the Quartermaster's Department fitted up a workshop for a moulder in plaster in the building in rear of the Museum, and also floored the lower hall of the main building and erected in it a large glass case. Hospital Steward Goulding, U.S.A., assigned to the duty of making plaster casts of pathological specimens, fell sick and died before he had perfected any of his work, but his place was supplied by Hospital Steward E. Schafhirt who has mounted over 100 of the casts and models contributed to the collection, and has made a number of new casts in a satisfactory manner. The casts, models, plans of hospitals, missiles and many miscellaneous subjects of interest are now arranged in the lower hall of the Museum.

Under the direction of Asst. Surgeon Woodward, U.S.A., the microscopical cabinet has received large accessories. Additional apparatus has been purchased and the means of investigations in this department are unquestionably of unsurpassed excellence. For several months Asst. Surgeon Curtis, U.S.A., has been engaged in experiments in microphotography and the results already attained have been favorably received by the scientific world.

In the surgical department 997 new specimens have been mounted and catalogued since October 3, 1864, and a large number of others, which were simply duplicates of specimens already in the Museum, have been mounted and laid aside for exchange. The specimens contributed during the past year have largely illustrated the reparative efforts of nature after gunshot injuries and the results of surgical operations. The undersigned has devoted all his leisure time to the compilation of a suitable catalogue of the surgical cabinet. Asst. Surgeons Porter and Stone have likewise been employed in this duty when not engaged in collating surgical statistics. Asst. Surgeon Woodhull at present devotes his whole time to the catalogue. About half the specimens are now described and it is hoped that the catalogue will be ready for the press in about four months.

In the medical cabinet the illustrations of the principal camp diseases of armies are very complete. Many valuable additions have been made during the past year in the shape of specimens of parasitic diseases, and anomalies and deformities, and of morbid processes in general. A large supply of confiscated whiskey having been turned over to the Museum by the Major General commanding the Department of Washington, a sufficient quantity of alcohol has been distilled to mount the wet preparations suitably. A sufficient number of glass jars is now on hand to meet the requirements of the Museum probably for a year to come.

Arrangements have been made to inaugurate a system of exchanges with the Museum of the Royal College of Surgeons of London, the Society for Medical Improvement in Boston, and the Pathological Society of San Francisco.

The number of visitors to the collection constantly increases. There has been a cordial collaboration on the part of surgeons in charge of hospitals, and an entire harmony and concert of action between the Medical and Surgical Departments of the Museum. The appropriation

for the coming year is ample for the expenditures at present. The Museum already occupies no mean place among scientific collections, and may be regarded as an object of just pride to the Medical Staff of the Army.

On November 3 D. S. Lamb, Hospital Steward, U.S.A., was assigned to duty at the Museum, in the medical side, under Dr. Woodward.

On December 13 the following specimens were selected to be sent to the Paris Exposition of 1867: Ambulance, medicine wagon, four litters and a model of a general hospital.

By the end of the year, the museum collection had become so large that the Surgeon General directed a subdivision as follows: (1) Surgical Section under charge of Dr. Otis; (2) Medical Section, and (3) Microscopical Section, under charge of Dr. Woodward; (4) Human Anatomy Section under Dr. Otis; (5) Comparative Anatomy Section under Dr. Woodward; and (6) Miscellaneous Section under Dr. Otis.

It may be remarked here that a series of 100 post-mortem examinations was made at the Freedmen's Hospital, Washington, from August 25, 1865, to May 18, 1866; the first nine by Steward A. J. Schafhirt, the remainder by Steward S. S. Bond, both of them attachés of the Museum. Steward Lamb assisted Bond from the time of appointment, November 3, 1865, until the close of the series. Still later, Steward Lamb made many other post-mortem examinations at the same hospital.

The following were published during the year, based more or less on work at the Museum:

By Dr. Woodward: "On the use of aniline in histological researches with a method of investigating the histology of the human intestines and remarks on some of the points to be observed in the study of the diseased intestine in camp fever and diarrhoea." Am. Jour. Med. Sc., Phila., 1865, XLIX, 106.

By Drs. Otis and Woodward, Circular No. 6, Surgeon General's Office.

"Reports on the extent and nature of the materials available for the preparation of a medical and surgical history of the rebellion." Washington, Nov. 1, 1865.

Surgeon General's Office, Army Medical Museum, Photographic Series, 109 photographs.

In the *Atlantic Monthly* of July, 1866, page 1, was an article by Dr. S. Weir Mitchell, of Philadelphia, entitled "The case of George Dedlow," purporting to be an account of an officer of an Indiana Regiment who was shot and suffered amputation in both arms and both thighs, his amputated legs being deposited in the Museum, Nos. 3486 and 3487. The story is fictitious, as no case of quadruple amputation was reported for the Army during the Civil War.

Through the courtesy of Dr. W. W. Keen of Philadelphia, Dr. J. A. Mitchell of Philadelphia furnished the following extract from Dr. S. Weir Mitchell's private papers, which is quite similar to the statement on page 142 of the Memorial Addresses, etc., of Mitchell, published in 1914:

I never again wrote anything for publication until the year after the war. One night I was conversing with my friend, Henry Wharton, on the subject of the loss of limbs. I mentioned the singular phenomena connected with this loss and spoke of a man who had lost both legs and both arms in the fight at Mobile Bay. Wharton, who was fond of such talk, laughingly suggested that possibly a man might thus lose a certain part of his consciousness of his own individuality. After he left I began to amuse myself by writing the history of such a person. I was at a loss for a name when, standing on a step in Price St., I saw opposite me, on a jeweler's sign, "Dedlow." I thought this a good name for a man who had lost his legs and so called this "The Case of George Dedlow."

I loaned this to my friend, Mrs. Casper Wister, who gave it to her father, the late Rev. Dr. Furness, to read. Then I forgot all about it. I was a busy practising doctor. It had been the amusement of one or two evenings. Dr. Furness sent it to the Rev. Edward E. Hale, then editor of the *Atlantic*, and to my surprise and amusement I received a check, I think about eighty dollars, and the proof of my story.

It was considered so important that it was made the leading article in the next number but one of the *Atlantic*. It attracted immense attention. So real did it appear that subscriptions were made for the unfortunate man, inclosures directed to what was known as the Stump Hospital at Philadelphia, and for a long while no one knew who had written this marvellous history.

The old Ford's Theater building in which President Lincoln was buried had been closed after the tragedy. Congress had authorpancy and purposes of the Museum and the Pension Records. The 453 Tenth Street, N.W., and repaired and was nearly ready for occu-

On October 20 Dr. Otis requested the Q. M. G. to occupy it. Its old number was the cases in the Museum in order to give the use of it to take down Medical Department of Columbian College (or Natig to the College, as it was then called) for lecture purposes. Medical

On November 12 Dr. Otis asked the Quartermaster for w begin the removal of specimens from the H Street building to s to Ford's Theater building. The removal now proceeded some ld irregularly until December 8, when it was completed. The part un charge of Dr. Woodward occupied in removal from November 19 to 2 r.

On December 11 the removal of material and records from 180

Pennsylvania Avenue to the museum building began and was completed, and No. 180 was vacated December 21.

In 1867 copies of the Surgical Catalogue, as well as other publications of the Surgeon General's Office, were from time to time sent to institutions and persons abroad. The acknowledgments were usually perfunctory. (See Bull. Acad. Imp. de Méd., Paris, 1870, XXXV, p. 274, March 29, 1870.)

During the Civil War, the accessions to the Museum consisted principally of specimens illustrating the injuries and diseases that produce death or disability during war, thus affording material for precise methods of study of problems regarding the diminution of mortality and alleviation of suffering in armies; only a few acquisitions had been made of anatomical objects, or of specimens illustrating subjects collateral to military medicine.

To enlarge the scope of the Museum, Surgeon General J. K. Barnes through Circular No. 2, Surgeon General's Office, April 4, 1867, invited medical officers of the Army to contribute, besides medical and surgical specimens, the following:

1. Rare pathological specimens from animals, including monstrosities.

2. Typical crania of Indian tribes; specimens of their arms, dress, implements, rare articles of their diet, medicines, etc.

3. Specimens of poisonous insects and reptiles, and their effects on animals.

On April 13, the museum collection had been arranged and on the 16th was officially opened to visitors.

The total number of visitors who registered their names from April 16 to December 31 was about 6,000.

Hospital tents, as well as the other articles previously mentioned, had been sent to the Paris Exposition of 1867.

Two Catalogues were issued during the year 1867 as follows:

"Catalogue of the Medical Section of the United States Army Medical Museum. Prepared under the direction of the Surgeon General, U. S. Army, by Brevet Lieut. Colonel J. J. Woodward, Assistant Surgeon, U. S. Army, in charge of the Medical and Microscopical Sections of the Museum." Washington, Government Printing Office, 1867, 4to, pp. 135 (described 877 specimens).

The classification was in eight chapters as follows:

1. Nervous system, under which were Brain, Membranes of brain, Pineal gland, Blood vessels of Encephalon, and Spinal cord.

2. Organs of circulation, under which were Heart, Arteries and Veins, Lymphatic glands and Thyroid gland.

3. Respiratory organs, under which were Air passages, and Lungs and Pleura.

4. Digestive organs, under which were Mouth, Pharynx and Oesophagus, Stomach, Intestinal canal, Peritoneum and Omentum, Liver, Pancreas and Spleen.

5. Urino-genital organs, under which were Kidneys, Suprarenal capsule, Urinary passages and Bladder, Male organs of generation, and Female organs of generation and Fetus.

6. Organs of locomotion, under which were Muscles and Fasciae, and Bones and Joints.

7. Integument.

8. Anomalies and Monstrosities.

The specimens had been prepared by Hospital Stewards A. J. Schafhirt, S. S. Bond and D. S. Lamb.

"Catalogue of the Microscopical Section of the United States Army Medical Museum. Prepared under the direction of the Surgeon General, U. S. Army, by Brevet Major Edward Curtis, Asst. Surgeon, U. S. Army." Washington, Government Printing Office, 1867, 4to, pp. 161 (described 2,120 specimens).

The classification was as follows:

Part 1st. Mounted preparations for the microscope; 18 chapters.

1. Connective tissue system.
2. External tegumentary system.
3. Muscular system.
4. Osseous system.
5. Vascular system.
6. Nervous system.
7. Digestive organs.
8. Respiratory organs.
9. Urinary organs and suprarenal glands.
10. Sexual organs, ova and fetal appendages.
11. Organs of vision.
12. Organ of hearing.
13. Organ of smell.
14. Pathological growths.
15. Parasites.
16. Articles of food and clothing, and materia medica.
17. Diatomes and other test objects.
18. Miscellaneous.

Part 2nd. Photographic negatives of microscopic objects; 18 chapters with the same titles as under Part 1st, omitting sections 9 to 13.

Part 3rd. Photographs presented to the Museum.

The specimens, except where otherwise stated, were prepared and mounted, the greater part by Dr. J. C. W. Kennon, the remainder by Asst. Surg. Curtis and Hospital Steward E. M. Schaeffer.

Ford's Theater building when taken for museum purposes was

altered as follows: Three floors, consisting of brick arches resting on iron girders, were put in and a main stairway of iron. But the roof, which was covered with slate, consisted of ordinary wooden beams supporting pine sheathing boards, and the upper hall occupied by the Museum was ceiled with lath and plaster fastened to wooden studding. The north wing of the building, which was under the great roof, was of ordinary dwelling-house construction with wooden floors and stairways; the same was true of the south wing, which, however, had a separate roof. (Dr. Woodward's letter to the Surgeon General, Oct. 15, 1877.)

Early in 1878 it was found necessary to tear down the back wall of the south building and build it up anew; it was badly cracked. In the fall of 1878, the owner of the property immediately north of the museum building tore it down in order to erect a new building, intending to have a cellar excavated. This necessitated underpinning the north wall of the museum building, which did not extend down as far as the excavation for the intended cellar.

The following is the description of the building by Dr. Woodward in 1871.[5]

The Army Medical Museum is situated on Tenth Street between E and F where it occupies a portion of a building, the rest of which accommodates a branch office of the Surgeon General. This building was formerly well known to the visitors of Washington as Ford's Theater. It is a plain brick structure, three stories high, 71 feet front and 109 feet deep. At the rear of the North side of the main building is a small wing which accommodates some of the Museum workshops, another wing at the front of the South side contains the chemical laboratory and the offices of the medical officers on duty. The whole establishment is devoid of any pretention to architectural beauty, and the exterior being painted dark brown has a rather gloomy aspect.

The upper story of the main building is the principal hall of the Museum. It is well lighted by windows in front and in rear, and by a large central skylight which has beneath it in each floor an oblong opening through which the light falls into the departments below. The numerous glass cases for the accommodation of specimens, which cover all available wall space, and stand out in long lines upon the floor, are most of them constructed in the plainest manner, with frames of fine wood painted white, for use evidently rather than for show. The floors are of brick on iron arches; that in the Museum hall being covered with encaustic tiles; the principal stairway is of iron, and the roof is covered with slate.

This portion of the establishment may therefore be regarded as nearly fireproof. Unfortunately this is not the case with the wings, for the protection of which a plentiful supply of hose is kept in readiness, and a steam force pump is connected with the boiler of the steam heating apparatus for use in any emergency.

[5] "The Army Medical Museum at Washington." Lippincott's Magazine, March, 1871, p. 233.

On January 13, 1868, Dr. Otis wrote a series of letters to army medical officers in regard to procuring, for the Museum, crania and weapons of American Indians. On January 14, he wrote another series of letters stating that a subsection of the Museum had been formed to include diseases and injuries of the lower animals and asking for specimens.

In February a circular from the Surgeon General was issued asking among other things for photographs and casts showing the results of injuries, and also for pathological specimens.

On February 27 Dr. Woodward recommended that Dr. D. S. Lamb, Hospital Steward, U. S. A., be appointed Acting Asst. Surgeon, U. S. A. He was appointed April 1.

In May Prof. Henry of the Smithsonian Institution donated to the Museum about 150 Indian crania. In this month, also, the Museum acquired the "Gibson" collection. The history of this acquisition is as follows:

In a letter of John H. Janeway, Asst. Surgeon, U. S. A., Office Medical Purveyor, Richmond, Va., January 6, 1866, to A. A. Woodhull, Asst. Surgeon, U. S. A., Surgeon General's Office, he said:

Doctor: In accordance with your note of Dec. 29, 1865, I visited in company with Dr. Gaillard of this city and Col. I. Simons, U. S. A., Medical Director of this Department, the collection of the late Dr. C. B. Gibson, now offered for sale, and have the honor to transmit herewith a catalogue of the same. The great bulk of this collection was made by Prof. Wm. Gibson, Emeritus Professor of Surgery, University of Pennsylvania, and which for a long time was used by him in his lectures, and well known for its completeness and great value.

The forty-two oil paintings, aside from their professional value, are of great value as works of art. The osteological part of the collection I consider unique, embracing I think every known fracture and disease of bone, and showing the powers of nature in the repair of the same. A number of specimens are from Waterloo. I think that this part of the collection would be of great value in filling a gap in the Army Museum, which must necessarily exist, showing reunion after fractures, sabre cuts and repair from disease.

The wax preparations are elegant specimens and the leather ones, though not much used now, are the finest that I have ever seen. The whole collection is in good state of preservation, specimens well mounted and enclosed in upright cases. The college at New Orleans and at this place and some parties in Philadelphia have been writing about the price, etc. Mrs. Gibson proposes in regard to the price the following, which I consider very liberal. She will appoint one professional man, the other party to appoint one, and the two to appoint a third, and she agrees to be bound by the decision of the three.

In 1868 the Museum bought the collection. Dr. Janeway was still on the spot. He wrote April 23 to the Surgeon General:

I have the honor to report that I purchased yesterday at public auction, for cash, the entire collection known as the "Gibson Cabinet," for the sum of $1,015.00. I was induced to exceed by $15.00 the limit prescribed in a communication from your office, dated April 18th, by the fact that a large collection of urinary calculi, all very valuable, and some exceedingly rare, was added to the cabinet at the time of sale. These were not included in the published catalogue, and will fill a vacancy now existing in the Army Medical Museum, and had they been offered as a separate lot it would have brought considerably more than I gave for them, parties being present who were anxious to purchase them.

In a private note to Dr. Otis, Dr. Janeway said that [Dr.] Gross was prepared to go $750 himself and $250 for another party if the collection had been sold by lots or specimens. . . . Was it Baxter, or who the Devil was it that sent me under the frank of Senator Yates that resolution concerning the appropriation, forbidding the Surgeon General to use any more money?

On May 6 the Surgeon General held a reception at the Museum, for the American Medical Association, which was then meeting in Washington. Dr. Woodward showed transparencies of microphotographs.

On September 1, the following was issued:

War Department, Surgeon General's Office,
Washington, D. C., *September* 1, 1868.

Memorandum for the Information of Medical Officers.

The officers of the Medical Staff are informed that a craniological collection was commenced last year at the Army Medical Museum, and that it already includes 143 specimens of skulls. The chief purpose had in view in forming this collection is to aid in the progress of anthropological science by obtaining measurements of a large number of skulls of the aboriginal races of North America. Medical Officers stationed in the Indian country or in the vicinity of ancient Indian mounds or cemeteries in the Mississippi valley or the Atlantic region have peculiar facilities for promoting this undertaking. They have already enriched the Mortonian and other magnificent craniological cabinets by their contributions, and it is hoped they will evince even greater zeal in collecting for their own Museum. A list of the crania now in the possession of the Museum will soon be published in the Catalogue of the Osteological Series of the Anatomical Section. It is sufficient here to state that 47 of the 143 specimens are Indian crania from the following tribes: Tsuktshi, 1; Flathead, Chenook, Selipsh, Nisqually, 13; Californian, 2; Piegan, Spokane, Mandan, 3; Arickaree, Gros Ventre, 2; Sioux, Kaw, Minataree, Menominee, 6; Cheyenne, Kiowa, Arrapahoe, Wichita, 10; Navajo and Apache, 5; doubtful or mixed breeds, 5. These crania were collected by Brevet Lieutenant Colonels J. Cooper McKee, D. C. Peters, C. C. Gray, F. L. Town, Surgeon B. E. Fryer, Brevet Majors J. F. Weeds, W. H. Forwood,

Acting Assistant Surgeons W. Matthews and G. H. Oliver, Dr. George Suckley, Mr. George Gibbs, Lieutenant (now Brevet Major General) G. K. Warren, and Mr. Lloyd Brooke. Information has been received of the shipment of an interesting series of crania exhumed from an ancient Indian mound near Fort Wadsworth, Dakota Territory, by Acting Assistant Surgeon A. I. Comfort, and of many crania procured at the instance the Medical Directors of the Department of Columbia and the District of Texas.

While exotic and normal and abnormal crania of all descriptions are valued at the Museum for purposes of comparison, it is chiefly desired to procure sufficiently large series of adult crania of the principal Indian tribes to furnish accurate average measurements. Medical Officers will enhance the value of their contributions by transmitting with the specimens the fullest attainable memoranda, specifying the locality whence the skulls were derived, the presumed age and sex, and, in the case of "Mound" skulls, or of those from cemeteries, describing the mode of sepulture, and any traces of weapons, implements, utensils found with the specimens, or any other circumstance that may throw light on their ethnic character.

The subject is earnestly commended to the attention of the Medical Officers of the Army.

By Order of the Surgeon General:

C. H. Crane,
Assistant Surgeon General, U. S. Army.

On January 14, a letter was sent to the Surgeon General, as follows:

Smithsonian Institution,
Washington, D. C., *January* 14, 1869.

Dr. J. K. Barnes,
Surgeon General, U. S. Army.

Dear Sir:

On the return of the exploring Expedition under Admiral, then Capt. Wilkes, the Government established a National Museum consisting of specimens of Natural History and Ethnology, which it subsequently placed in charge of the Smithsonian Institution, with authority to increase the collection by exchange and otherwise. The Government having since established an Army Medical Museum to be composed of specimens to illustrate the various branches of science connected with anatomy, physiology, medicine and surgery, and also a Museum in charge of the Department of Agriculture to consist of articles intended principally to illustrate the economical resources of the country, it is important that these establishments should be in harmonious cooperation in order that the collections of the Government in the city of Washington may be complementary to each other, or in other words, each as perfect as possible in definite lines.

With this view I address you at present in regard to an exchange of specimens which are now in possession of the Army Medical Museum, relative to Indian Archaeology and Anthropology, for specimens relative to human and comparative Anatomy in the Smithsonian Institution. The specimens referred to as now in our possession consist of

a series of skulls which I am informed will be required for the preparation of a monograph, under your direction, of the crania of North America. Those for which we propose to make an exchange and which are in the Medical Museum, consist of a collection of objects illustrative of the manners, customs and arts of the Indians of this continent.

Hoping to receive a favorable response to this proposition, I have the honor to be with much respect, yours etc.

(Signed) Joseph Henry,
Secretary, Smithsonian Institution.

The Assistant Surgeon General, Dr. C. H. Crane, endorsed on the letter, the following to Dr. Otis, Curator of the Museum, January 15: "As the Surgeon General will be most happy to make the exchange proposed by Prof. Henry, and as you are familiar with the entire negotiations, please write a suitable reply to this letter for the Surgeon General's signature."

Already, however, in May, 1868, Prof. Henry had sent about 150 Indian crania to the Army Medical Museum.

The following is the letter from Dr. Otis to Prof. Henry, January 21:

Referring to your letter to the Surgeon General of January 14, and to his reply of the 16th, I have the honor to inform you that I have been authorized by the Surgeon General to make the necessary arrangements with the conservator of the Smithsonian Anatomical collection for the proposed exchange of the objects illustrative of the manners and customs of the Indians of North America and of Indian archaeology in the possession of the Army Medical Museum for the specimens illustrative of human anatomy in the Smithsonian collection. . . .

As the result of the negotiations, very many specimens from this time were exchanged between the Smithsonian Institution and the Army Medical Museum, and also between the Museum and the Department of Agriculture. For instance, in June, 1870, a lot of insects were sent to the Department of Agriculture; in July, 1878, an herbarium containing some 300 specimens. Most of these were received from army officers who sent them to the Museum. The number of specimens sent to the Smithsonian was very large; it is impossible to learn the number without a very tedious research, but it went into the thousands.

On January 22, Prof. S. F. Baird, of the Smithsonian, offered to transfer to the Army Medical Museum the monstrosities and embryos in the Smithsonian Institution. Dr. Woodward replied stating that he would be glad to have the monstrosities but did not care for the embryos. (Afterwards the Museum sought to get embryos.)

On May 17, a letter from General Crane, Asst. Surgeon General, to Dr. Otis, approved the sending of "anything" that could be spared and deemed best to Russia. "It is desirable to foster the fraternal relations which now exist between the subjects of the Tsar and our-

selves." (This remark had reference to the Russian Government sending its fleet to the United States during the Civil War.)

On August 12, Dr. Otis submitted to the Surgeon General a tabular statement of measurements of 697 crania in the Museum. He had had photographs made of the more remarkable crania according to the directions of the British Anthropological Society.

The Surgeon General's report for 1869–70 states that specimens had been exchanged with the Smithsonian Institution, Agricultural Bureau, Museum of College of Physicians, Philadelphia; Museum of New York Hospital, Peabody Museum at Cambridge, Mass., Blackmore Museum, England, and Museum at Oxford, England. Also that nearly all works on military medicine and surgery published in the previous five years had been partly illustrated from specimens in the Army Medical Museum; notably the works of Billroth and Pitha, Holmes' "System of Surgery," and Didiot's "Service de Santé des Amées."

In an article of August 11, entitled "Science schools and museums in America," by Saint George Mivart, published in *Nature*, London, page 290, is the following:

The Army Medical Museum contains a series of excellently numbered preparations of great professional interest, remarkable chiefly for its profuse exhibition of the effects of shot, shell and other implements of war on the human frame. The materials for this Museum were chiefly collected during the American civil war. It may well be said that the Americans are a wonderful people. There are few other nations which would have been capable of utilizing the results of a protracted internecine war as to make them available in after years towards the advancement of medical science and alleviation of human pain.

The preparation of bone specimens on a large scale, as had been necessary in the early years of the Museum, lacked the thoroughness necessary to avoid attacks from insects, and much dust and debris appeared in the Museum cases in spite of the free use of camphor. In time this annoyance ceased and the more thorough and much less frequent preparation of bone specimens precluded its recurrence.

Dr. Woodward, in a letter of November 13, 1872, to the editor of the *Evening Star* (Washington), said:

During the last few years it has been a favorite speculation in certain quarters, that epidemic diseases are produced by the presence in the atmosphere of vegetable germs, so minute as to be visible only with the microscope. Considerable labor has been bestowed upon microscopical work in this direction, but the results which have been confidently announced from time to time by enthusiasts have been either contradicted or so materially modified by subsequent observa-

tions that the question still remains in the domain of mere speculation. When we consider the number and variety of the organic germs which can be detected in the atmosphere by the microscope at all times, and when we remember that it is precisely those lower forms which have been best studied that are most abundant, we shall not be surprised that pretenders have found here a fit field for charlatanism, or that many well meaning but incautious persons have fallen into error. Nevertheless I certainly regard the microscopical forms which exist in the atmosphere and their possible influence on man as a proper matter for scientific study, and by way of contributing my mite to the difficult subject I would state that within the last few days I have collected the organic forms from a quantity of the air of a stable in this city, in which were a number of sick horses, and submitted them to the highest power of the microscope, without finding any which are not usually encountered when no epidemic is prevailing, and have also subjected the mucous discharge from the nostrils of several of the horses to the same examination with like negative results.

On January 18, 1873, Dr. Otis stated that few recent works on military medicine, surgery and hygiene had omitted to refer largely to the rich and reliable stores of information gathered within the walls of the Museum. A professor of Bonn made the study of the anatomical collection the object of a trip across the Atlantic.

During July, a two-story building in the alley running East from the Museum was bought for museum purposes. The first floor was fitted up for the use of the carpenter, and a distilling apparatus was placed in the second story for redistilling the waste alcohol.

Mr. John Eric Erichsen, of London, in the autumn of 1874 visited the United States and on his return to England gave a lecture at the University College Hospital, London, November 9, 1874, in which he said (see *Lancet*, London, 1874, II, page 720):

There is one museum which is so unique, so admirably arranged, and so interesting, that I must direct your attention to it for a few minutes. It is the Museum of the Army Medical Department at Washington. This magnificent collection, illustrating not only every possible variety of gunshot and arrow injury, but also those diseases which are more fatal than the bullet to an army in the field or in camp, has, under the able superintendence of Surgeon General Barnes, and of Drs. Otis and Woodward, been most admirably arranged and catalogued. It occupies a building that has a melancholy interest connected with it, as being the theater in which President Lincoln was assassinated by Booth in 1865. The collection itself is well known in Europe through the medium of those beautifully illustrated and ably collated medical histories of the great war of the Rebellion which have been published under the superintendence of the Medical Department of the United States Army. Many of the specimens in this Museum are quite unique. I would especially refer to a series illustrating splintering of the inner table of the cranium without fracture of the external table, consequent

on contusion of the skull; the splitting of conical bullets against sharp edges of bone; a collection of foreign bodies including arrow heads, forming the nuclei of calculi extracted from the bladder; and a remarkable series of specimens of injuries of the bones inflicted by arrow wounds in Indian warfare. To the physician the collection of diseases of the large and small intestine resulting from dysentery, diarrhoea, camp fevers, typho-malaria, etc., is most interesting. The preparations have been admirably put up by Dr. Woodward. In this collection will be found some very interesting specimens of resection of joints and bones after gunshot injury. I saw one patient [John F. Reardon] in whom the head of the humerus and several inches of the shaft, in all seven inches of the bone, had been excised. He was now a porter [a messenger] in the Museum, had a most useful and well-developed forearm and hand, serviceable for every purpose. There was not only the preparation but the living example of this triumph of conservative surgery. The case illustrates the important fact that the upper end of the humerus may be resected below the insertion of the deltoid and yet a useful limb be left. I saw another case of an officer who had lost about four inches of the shaft of the humerus, and in whom the limb was equally useful. In fact American surgeons are very skilful in the management of resections.

On April 18, 1876, as showing the variety of work required of the medical officers on duty at the Museum, Dr. Woodward stated to Prof. Henry, President of the National Academy of Sciences, that for the year ending June 30, 1875, under Dr. Woodward's direction, 54 specimens had been added to the Medical Section, 537 to the Microscopical Section, and 118 to that of Comparative Anatomy. He had also been engaged on the preparation of the second volume of the Medical History of the War of 1861–65. He had also undertaken special studies in microscopy, an investigation into the distinguishing characters of the fibers of wool and calf-hair, illustrated by a series of microphotographs; a series of investigations with regard to the diffraction phenomena observed in the field of the microscope which may give rise to erroneous views of minute structure; work had also been done in preparing a series of microphotographs of the blood of man and of those mammals whose corpuscles most closely approximate those of human blood in diameter. He had also to administer the Record and Pension Division. The amount of work in this division was shown by the fact that information in regard to claims for pensions had been furnished to the proper authorities during the year in 1542 cases. It might be added that there was, besides, a multitude of questions from correspondents to be answered on a great variety of subjects. Dr. Woodward was also making preparations for the exhibit of the Medical Department of the Army at the Exposition of 1876 at Philadelphia. He had charge of this exhibit, which included, so far as the Museum was concerned, a number of

microscopical and pathological specimens, models of hospitals, ambulances, litters, hospital ships, a hospital train and medicine wagons. Dr. H. C. Yarrow represented the Museum.

On July 10 Dr. Woodward stated that the vegetable germ theory of disease was not in his opinion a theory, but only a hypothesis resting on most imperfect and unsatisfactory data. It did not satisfy his mind, and the more he studied the subject the more he felt that consequences had been mistaken for causes.

Dr. Meusel of Gotha, Germany (Correspbl. d. allg. ärtzl. Vereins von Thüringen, 1876, V, 81–96), in an analysis of the catalogue of the Museum, said:

The riches contained in the catalogue are truly imposing. The Museum, in view of its aim and origin, is very rich in those chapters which are of specific interest to the military physician. The art and manner with which the material was collected gives us a high opinion of our colleagues, who in the midst of the bustle of war have brought it together scientifically. It gives us also a high opinion of the organization of the care of the American Army, if we recall how many conditions must be fulfilled, in order to give enough time and physicians, to prepare after a battle so many careful specimens, as, e. g., the big list of mortal wounds. They lost no time in preparing specimens of interest and instruction to the observer. The abstracts of case histories are brief and clear, the numerous illustrations excellent, and the aim to give complete information concerning the course of the disease and the result of an operation, deserves the greatest recognition. The value of many surgical procedures will become established after years. The classification is distinct and the description of individual specimens is the work of endless endeavor and of rich knowledge and experience.

But besides the rich contents of the catalogue and its excellent preparation, the circumstance concerning it that is most startling is, namely, that we see for the first time, in effect, a printed catalogue of a Museum. Through the fact that everybody is able to provide himself with a printed catalogue and that he may orient himself at home as to what he wishes to study, the Museum becomes a common possession of all physicians, and ceases to be the private treasure of some academician, difficult of access.

Philadelphia Exposition. Exhibit of Medical Department of the Army. Among the pamphlets issued in connection with this exhibit were the following that related to the medical side of the Museum:

No. 2. Description of models of hospital cars; No. 3. Description of models of hospitals; No. 4. Description of models of hospital steam vessels; No. 9. List of selected microscopical preparations from the Museum; No. 10. Description of the selected specimens from the Medical Section of the Museum. Also the following reproductions of photographs by Dr. Woodward:

Photomicrographs of Frustula saxonica, Navicula rhomboides, body scales of the mosquito and gnat.

Miscellaneous photomicrographs, diatoms, etc.

Photomicrographs, Fibres of wool, calf hair, etc.

Photomicrographs of Pleurosigma angulatum and formosum, Surirella gemma, and Podura scales.

Photomicrographs by Prof. J. W. Draper, New York, 1851–2.

Photomicrographs; Blood corpuscles of man, dog, etc.

Photomicrographs; Histology of minute bloodvessels and other histological photomicrographs.

Photomicrographs; Mosquito, parasites, proboscides, etc.

Photomicrographs of Nobert's 19th band plate, Webb's test, Nobert's wave plate, Amphipleura pellucida, etc.

Photomicrographs; Magnesium, Electric, Calcium lights and Sunlight.

Photomicrographs; Cancer.

Photographs illustrating rare books in the National Medical Library; two volumes.

Dr. Otis in the check list says:

The two series of collections that gave the Museum its distinctive character, viz., the surgical series of illustrations of the immediate and remote effects of injuries by war weapons and the operations incident to such injuries, and the medical specimens exemplifying the pathology of camp diseases, accumulated rapidly during the war; but few acquisitions were made of anatomical objects or of specimens illustrating subjects collateral to military medicine. Soon, however, many military officers at remote posts who had infrequent opportunities of contributing to the pathological material of the Museum, but earnestly shared in the general desire of members of the corps to promote its welfare, forwarded donations of Indian crania, of specimens of natural history, and of objects of ethnological or archaeological interest. The minerals, fossils, stone implements, pottery, etc., and the Indian curiosities, were exchanged with other museums, for objects more immediately connected with the purposes of the Army Medical Museum. Botanical specimens and the greater part of the contributions in natural history, including all pertaining to the invertebrata, were also held for exchange; but skulls or skeletons of mammals, birds, reptiles, amphibians, and fishes were retained, and formed the nucleus of the fifth section of the Museum, or section of Comparative Anatomy, of which a catalogue is given in the first of this series of pamphlets for the representation of the Army Medical Department at the International Exhibition of 1876. In addition to the anatomical objects above referred to, a number of elaborate preparations of the human skeleton in its various stages of development and of demonstrations of the muscles, bloodvessels, nerves, lymphatics, viscera and organs of special sense, were purchased in Paris for the convenience of examining boards or of students, and for other purposes of reference, and a number of similar specimens were prepared at the Museum. Soon afterwards the acquisition of the Gibson cabinet added many anatomical preparations, natural or artificial, and the exploration of tumuli by Surg. E. Swift, Dr. A. I. Comfort and others greatly augmented the collection of skeletons and crania. It

was now decided to group all these objects in a distinct section of the Museum to be designated section IV, including two series, one relating more especially to descriptive and topographical anatomy, the other to ethnology."

Also by Dr. Otis: "The Medical and Surgical History of the War of the Rebellion. Part II, Volume II, Surgical History." Washington, Government Printing Office, 1876. 1,044 pp., 35 plates, 747 figures.

By Dr. H. C. Yarrow, Contract Surgeon: "List of skeletons and crania in the section of Comparative Anatomy of the U. S. Army Medical Museum, Washington, D. C." 1876, 8vo, pp. 52.

By Dr. Lamb: "General tuberculosis." Trans. Med. Soc. D. C., 1876, III, 59. "Case of cancer of abdominal viscera." Ibid., 1877, IV, 86.

Dr. Woodward in his preface to the "List of skeletons and crania in the section of Comparative Anatomy of the U. S. A. Medical Museum, for use during the International Exhibition of 1876, in connection with the representation of the Medical Department, U. S. Army," says:

The list of the skeletons and crania in the section of Comparative Anatomy of the U. S. Army Medical Museum was prepared by Dr. H. C. Yarrow and is intended for distribution during the Centennial Exhibition among naturalists and others interested in comparative anatomy, for the purpose of showing the deficiencies of our collection, and soliciting contributions.

The collection constitutes one section of the Army Medical Museum which at present is divided into six sections, as follows:

In charge of Asst. Surgeon G. A. Otis, U. S. A., Curator, Surgical Section, 6,539 specimens; Anatomical section, 1,254 specimens; Miscellaneous section, 240 specimens.

In charge of Asst. Surgeon J. J. Woodward, U. S. A., Medical section, 1,279 specimens; Microscopical section, 7,275 specimens; Comparative Anatomy section, 1,522 specimens.

The Army Medical Museum was created primarily for the purpose of preserving specimens illustrative of the wounds and diseases which produce death and disability during war, with the view of thereby illustrating the study of methods for diminishing mortality and alleviating suffering among soldiers. It is now the desire of the Surgeon General that so far as the means placed at his disposal will permit, the collection shall be extended so as to embrace all forms of injuries and diseases, so that eventually it shall become a general pathological museum, accessible for study to all medical men who are prosecuting original inquiries. Of the great usefulness of such a collection it is unnecessary here to speak, or to point out how vain all hopes have proved that any large collection of this kind can be created, except with the aid and support of Government. A cabinet of comparative anatomy furnishes the means for useful collateral studies, subordinate to the general purposes of a pathological museum; hence such cabinets are found in connection with most of the great pathological collections of Europe, and one has been commenced at the Army Medical Museum.

The appropriations for the support of the Museum have been hitherto

too limited to permit the expenditure of any considerable sum on the collection of comparative anatomy. The specimens enumerated in the following list were for the most part collected by medical and other officers of the Army on duty at frontier posts. For the present, any increase of the collection can only be expected from such donations, which will thankfully be received from army officers or others or from exchanges of duplicate specimens, which, however, as yet are only possible to a very limited extent.

Specimens presented need not be thoroughly cleaned and mounted. This laborious work is done in the Museum by Dr. F. Schafhirt, by whom the greater part of the specimens enumerated in the following list were prepared. It will be sufficient in the case of large skeletons or crania if the flesh is roughly dissected from bone, and the viscera, brain, etc., removed. The preparation thus prepared can be packed in a mixture of sawdust and salt or simply dried for transportation. Small animals are best preserved in alcohol, in which case an incision should be made along the middle line of the abdomen to give the alcohol access to the viscera.

The following appeared in the Report of the Surgeon General for 1879–80:

I would respectfully invite attention to the overcrowding and unsafe condition of the building Nos. 509–11 Tenth Street, N.W., now occupied by the Record and Pension Division, the Division of Surgical Records and the Library of this office, as well as by the Army Medical Museum. By the continued growth of these valuable collections the space available for their preservation has become quite inadequate, not merely for their proper display, but even for satisfactory storage. In the building now occupied these collections are continually exposed to the danger of destruction by fire. This building is surrounded by inflammable houses and sheds on private property, over which the officer in charge can of course exercise no control whatever, and which are in immediate contact with its north and south wings. These wings are not fireproof and although the main building is provided with three fireproof floors its roof is not fireproof.

The sad experience of the Smithsonian Institution in 1865 and of the Patent Office in 1877 has demonstrated that the perils to which collections preserved in such a building are exposed in case of fire, are not materially diminished by the fireproof floors beneath; but in both cases referred to, the extent of the damage was limited to the upper story by the substantial character of the walls and floors. The walls of the Tenth Street building are not only weak but much out of plumb, so that it is to be feared that destruction by fire of the roof would not only involve the whole Museum collection in the third story, but by the fall of at least a portion of the walls the destruction of the contents of the lower stories, including the library and the records, would result. The most probable source of danger is from accidental fire in the adjoining private property. Such a fire actually occurred in January, 1875, but was fortunately subdued by the exertions of the employees of our building before damage was done.

I therefore earnestly recommend an appropriation for a new fireproof building adequate to the present needs, and reasonable future expansion of all the collections now stored in the unsafe building on Tenth Street. Such a building should be absolutely fireproof, but no expenditure for architectural display is required. I find on inquiry that a suitable structure can be erected at a cost not to exceed two hundred and fifty thousand dollars.

On July 2 President Garfield was shot and died September 19. During his illness, Surgeon General J. K. Barnes and also Dr. Woodward were called in attendance and both, especially Woodward, gave much time to the attendance. After Garfield's death, examination was made by Dr. D. S. Lamb, practically under direction of Dr. Woodward, Surgeon General Barnes and others being present. Two specimens were obtained; the fractured vertebrae, No. 10800, and the aneurism of splenic artery, No. 10801. (See the "Official record of the post-mortem examination of President James A. Garfield, signed by Drs. D. W. Bliss, J. K. Barnes, J. J. Woodward, Robert Reyburn and D. S. Lamb." Am. Jour. Med. Sc., 1881, LXXXII, 583–590. Also Reprint.)

On January 6, 1882, the Secretary of War, Robert T. Lincoln, recommended to the President, and on January 19, President Arthur recommended to Congress a new building for the Museum. The matter was referred to the House Committee on Public Buildings and Grounds.

On June 30, Charles J. Guiteau, the assassin of President Garfield, was executed. Dr. Lamb, assisted by Drs. J. F. Hartigan and Z. T. Sowers, and by Dr. J. C. McConnell and Ernest Schafhirt of the Museum, made an autopsy and obtained a much hypertrophied spleen, No. 9076, Path. Series; and the skeleton, Nos. 3245 and 3425A, Anat. Series.

Publication by Dr. Lamb, based mainly on work done at the Museum: "Report of the post-mortem examination of the body of Chas. J. Guiteau." Med. News, Phila., 1882, XLI, 13. Also Reprint.

On February 28, 1883, the Committee on Public Buildings and Grounds of the House of Representatives through Mr. Shallenberger made a favorable report on the proposed new museum building. (Report No. 1995) with an amended bill (H.R.7681) which provided for three doorways on the south side and some minor differences in internal arrangements.

On December 28, the following order was issued:

War Department
Surgeon General's Office

Washington, D. C., *December* 28, 1883.

Orders:

Major D. L. Huntington, Surgeon, U. S. Army, is hereby relieved from duty as Curator of the Army Medical Museum, and assigned as Assistant to the Surgeon General.

The Army Medical Museum and the Library of the Surgeon General's Office are consolidated into one division, to be known as the MUSEUM AND LIBRARY DIVISION of the Surgeon General's Office. Major John S. Billings, Surgeon, U. S. Army, is assigned to duty in charge of this division, as Curator of the Army Medical Museum and Librarian of the Surgeon General's Office. Mr. C. J. Myers, Clerk class four, will report to Surgeon Billings for duty in this division.

The "Division of Surgical Records" is discontinued. The records, books and files pertaining thereto are transferred to the Record and Pension Division, of which they will hereafter form a part.

To the Museum and Library Division is assigned the use of the second and third floors of the building on Tenth Street, to which will be transferred, so far as may be possible, all of the books, etc., belonging to the Library, together with the clerks and other employees engaged in library work.

Surgeon Billings and Assistant Surgeon Pope are charged with the supervision of the removal of records, books, files and other property, as well as the assignment of rooms and other details necessary to carry this order into effect.

(Signed) R. MURRAY,
Surgeon General, U. S. Army.

The following appeared in the Report of the Surgeon General, 1882–3:

In 1866 a Catalogue of the Army Medical Museum was prepared by this office and printed at the Government Printing Office. The Museum collection contained at that time 4,719 specimens in the Surgical Section, 877 in the Medical and 2,120 in the Microscopical, a total of 7,716 specimens. Since then the number of surgical specimens has been increased to 7,265, of medical specimens to 1,705, and of microscopical specimens to 8,881; and three new sections have been added to the collection, viz., an Anatomical section containing 2,143, a section of Comparative Anatomy containing 2,481, and a Miscellaneous section containing 727 specimens; making a total of 23,202 specimens now in the Museum collection, of which less than one third are described in the catalogue of 1866.

A manuscript catalogue is now in course of preparation which will include a description of all specimens in the Museum at the present time. As such a catalogue is indispensable to the practical usefulness of so valuable a collection, it is hoped that authority may be granted by Congress for the printing and binding of this work at the Government Printing Office.

At the New Orleans Exposition, in 1884–85, the Museum was represented by models of hospitals, hospital boats and cars, ambulances, litters, medical chests and knapsacks, photographs and books, catalogues and circulars, series of microscopes and slides, crania and pathological specimens.

On December 14, a joint resolution was introduced in both Houses

of Congress for preparing an illustrated catalogue of the Museum, but did not pass. During this month, the moving of the museum specimens into the new building proceeded.

Dr. Billings contemplated having a Guide Book printed for the Museum and Library; to wit:

Guide Book for the Army Medical Museum and Library, N.W. Cor. 7th and B Streets S.W., Washington, D. C.

Exterior view taken from the southwest, as frontispiece.

Historical Introduction.

Description of the building with floor plans of main and second floors and of third floor of center building.

Objects of the Museum; general arrangement of the contents; description of special interesting specimens in the different cases.

General description of the Library; of the Index Catalogue; notice of some of the important rare books, etc.

To make about 60 pages, octavo, long primer.

The book was not printed. The following is his description of the building:

The Army Medical Museum and Library building is situated to the east of the National Museum and the Smithsonian Institution, at the intersection of Seventh and B Streets Southwest, facing B Street on the south, with the east wing abutting on Seventh Street. It is easily accessible by the Pennsylvania Avenue and Seventh Street cars, and by the Belt line. The building was erected on a reservation of 270 x 160 feet, at a cost of $200,000, according to plans prepared by the architect, Mr. A. Cluss, under instructions from Surgeon J. S. Billings, U. S. Army, acting for the Surgeon General, and was finished in the fall of 1887. It is exceedingly plain, without ornamentation, and consists of a center building, two wings and an annex to the center building in the court-yard. The walls are of brick, constructed with a bonded internal lining of hollow brick for all walls exposed to the weather. The moulded work and the cornices consist of pressed brick and terra cotta. The floors of the first story are constructed of brick arches between rolled iron beams. The floors above are formed of flat arches, built of hollow bricks between rolled beams. The roofs of the center building are constructed similarly to the floors but of lighter material. The columns used are of fireproof sectional wrought iron. The Library and Museum are constructed so as to form fireproof compartments separated from the other parts of the building. The stairs are of wrought and cast iron. The center building, 112 feet in length and 55 feet in width, has a basement and four stories, respectively eleven, fifteen, fourteen, thirteen and twelve feet in height; the wings are sixty by one hundred and thirty-one feet and, with basements of eleven feet in height, and first stories of fifteen feet. The second story, devoted one to the Museum, the other to the Library, are open to the roof and ventilated by continuous lantern skylights. These halls are thirty-one feet high to the eaves and forty-seven feet high to the ridge of the lantern. The east or Museum wing has a gallery fourteen feet wide and twelve feet

six inches above the floor. The annex connected with the center building by a covered passage is fifty-two feet in length and twenty-four in width, and has a basement in which are the steam-boilers, pumps and coal cellar, and two stories containing rooms for the anatomical and biological laboratory.

The First Floor.—Entering the building on the south side and turning to the left or west, the corridor with office rooms on each side leads to a large hall supported by iron columns, which extends the whole length of the west wing. The hall and the offices on the corridor leading thereto are assigned to clerks of the Record and Pension Division of the War Department. Here are kept the records of the hospitals of the war of the rebellion, from which the Pension Office is furnished with data relating to the medical history of the applicants for pensions. On the corridor to the right of the main entrance, leading to the east wing, are two additional rooms for clerks of the Record and Pension Division and two rooms occupied by the Chemist of the Surgeon General's Office. In the east wing on this floor is a room containing an outfit of furniture, medicines, etc., for a post hospital, a room for specimens of genito-urinary organs; also for reserve specimens; a dissecting room, an anatomist's room and a dark room.

The Second Floor.—On the second floor of the center building are found the offices of the Surgeon in charge and of the clerks connected with the Library, and a reading room for those who wish to avail themselves of books in the Library. In the east wing on this floor is the Museum and in the west wing the Library.

The Third Floor.—Of the rooms on this floor five on the south side are occupied by officers and clerks connected with the Museum; on the north side the room next to the Library wing is the Microscopical room, and that next to the Museum the anthropometrical room. In the latter are found apparatus for testing color sense, error in estimating squareness, judgment of eye, swiftness of blow, strength of pull and squeeze, delicacy of muscular sense; scales for measuring height and span of arms; test-type apparatus, Wolpert's air-tester; J. McK. Cattell's instrument for measuring reaction time, A. T. Keyt's sphygmograph, Snellen's phakometer, an aesthesiometer, Hall and Donaldson's instrument for testing motor sensations on skin, optometers, kymograph, aeroscope, aerobioscope, etc.

The Fourth Floor of the center building contains the Photograph Gallery and a number of storerooms, two of which are filled with travois, litters, cacolets, and other appliances for transportation of sick and wounded in the field, for which no space could be found in the Museum Hall.

On February 15, 1888, the removal of the museum specimens to the new building was completed.

On June 1 the annex to the museum building was completed.

On August 10 Dr. Billings recommended Dr. Gray for promotion, saying: "Dr. Gray is a skilled microscopist, and is upon the whole, I think, the best preparer of microscopic specimens in this country, and probably the best maker of photomicrographs anywhere." On August 24, Dr. Gray was appointed Contract Surgeon.

On September 20, a reception was given to the Congress of American Physicians and Surgeons at the Museum. Dr. Billings read an address on Museums, treating more especially of the Army Medical Museum. The address was published in *The Medical News*, Philadelphia, 1888, LIII, 309.

At the World's Columbian Exposition at Chicago, in 1892–3, the Museum was represented very much as at previous expositions: a model of a post hospital, in which were exhibited beds, hospital furniture and supplies, specimens from the Museum and books from the Library. Dr. Gray was for some time on duty at this Exposition.

On July 7, Major Walter Reed, U. S. Army, who was also on duty at the Exposition, was ordered to report to the Surgeon General.

During the summer, preparations were made for installing an Army Medical School in the Museum building.

On October 17 some scrapings from the chair used by President Lincoln at Ford's Theater in April, 1865, when he was shot by Booth, were examined by Dr. Gray, who reported that he found blood cells. This was 28 years after the tragedy.

In October, 1893, the Army Medical School, which had been established by order of the Secretary of War, began its first session, 1893–94, in the Museum building, occupying parts of the first and third floors.

On October 1, 1895, Dr. Billings, having been appointed professor of hygiene in the University of Pennsylvania, was retired from active service in the Army, and was therefore relieved from duty at the Museum and Library.

On August 19 Lieut. Col. David L. Huntington, U. S. A., was appointed in charge of the Museum and Library.

The following is an extract from a letter of Dr. L. E. Rauterberg, addressed to the Senate Committee on Vivisection:

> It was my lot for a number of years to be engaged in the Microscopical Division of the Army Medical Museum, and I saw practiced the most inhuman and barbarous mutilations of the dumb animal, under the supervision and with the sanction of the United States officers in charge. A desired part or section of the animal would be removed, not under anesthesia, and the poor beast would be then placed back in its cage or vessel until it suited the convenience of the operator to help himself to another portion, so long as the animal would survive these tortures. I have thus seen animals with eyes, section of brain and other parts removed, and kept in reserve for future experiments for a number of days, and all for the verification and repetition of results obtained and published years ago.

On June 5, Dr. Walter Reed, Curator of the Museum, wrote to Dr. McConnell, who had resigned from the Museum in December, 1895, as follows:

My Dear Doctor:

I understood you to say that you were willing to testify that the statements made by Dr. C. A. Norton (L. E. Rauterberg?) with regard to the cruelty practiced upon animals in the Army Medical Museum some years ago were false in every particular. Will you not oblige me by addressing either Dr. Huntington or myself a letter, stating that his assertions are false, that you were connected with the work and have every means for knowing that there was no foundation for his statements before the Senate Committee.

To Dr. Reed's letter Dr. McConnell replied as follows:

609 Third St., Washington, D. C.,
June 8, 1896.

Surgeon Walter Reed, U. S. A.,
Curator, Army Medical Museum,
Washington, D. C.

Dear Sir:

In reply to your letter of June 5, 1896, enclosing an extract from the Report of the Senate Committee on the District of Columbia on the subject of vivisection, I would say that a very wonderfully distorted, inaccurate and false description has been given of work conducted at the Army Medical Museum some twenty years ago. Those who were practically engaged in the Microscopical Division should know better than anyone else the character of the work that was performed, and that all animals experimented upon were under the influence of an anaesthetic. One who was not in any manner connected with the Microscopical Division of the Museum, as was the case with Dr. L. E. Rauterberg, could draw upon his imagination very satisfactorily, and write a vivid description of what might have been done with animals, the remains of which he saw under alcohol in specimen jars. I, however, testify that at no time during my connection with the Army Medical Museum, from about 1870 to the end of the year 1895, have any experiments been performed upon animals in which an anaesthetic was not used, unless some of the ordinary inoculation experiments, which are practically painless, nor were animals kept in a mutilated condition.

Very respectfully,
(Sgd.) Dr. J. C. McConnell.

In view of this Senate investigation of vivisection, the Medical Society of the District of Columbia passed resolutions, one of which invited the societies, colleges and bureaus in the District that were interested in the matter, to appoint delegates to form a committee to be known as the "Joint Commission on Vivisection" which would inquire into the practice of vivisection in the District and also represent before Congress the interested organizations. On this Commission Dr. Walter Reed, Curator of the Museum, was appointed October 18.

On February 8, 1906, the following classification of specimens (not however complete) was adopted. It was made by Dr. Carroll and Dr.

Healy and was based largely, if not entirely, upon that used in the Pathological Laboratory of McGill University, Montreal, Canada:

ARRANGEMENT AND CLASSIFICATION OF MUSEUM

The arrangement shall be in four main systems, viz.,

1. General Pathology.
2. Special Pathology.
3. Regional Pathology.
4. Miscellaneous.

The classification shall consist of a major or anatomical classification, represented by the units 1–0 placed on the left of the decimal point, and a minor or pathological classification represented by the units 1–0 placed on the right of the decimal point. The miscellaneous system being represented by the double 0—thus 00— placed on the left of the decimal point, and its subdivisions by the units 1 to 0 placed on the right of the decimal point. The normal anatomical units will be represented by the simple units, each specimen being indicated by a small index figure placed at the upper and right side of the unit; thus a normal heart would be numbered 12^1. One standing for the circulatory system, two for the heart, and the index figure ^{1} for the individual specimen. The pathological lesions will be represented by the units 1 to 0 placed on the right of the decimal point. Thus a persistent fetal structure in the heart would be numbered 12.11^1, the .1 standing for abnormalities and .11 for persistent fetal structures. The comparative anatomy specimens will be indicated by a small index figure placed to the left and below the anatomical units. Thus the heart of a cow would be numbered 112^1, the small index number to the left indicating the order mammalia. The contributed photographs will be indicated by placing the small index figure used for the individual photograph to the right and below the descriptive number. Thus a photograph of a specimen of persistent fetal structure in the heart would be numbered thus, 12.11_1.

The major or anatomical classification is as follows:

1. *Circulatory System:*
   - 11. Pericardium.
   - 12. Myocardium.
   - 13. Endocardium.
   - 14. Heart as a whole.
   - 15. Arteries.
   - 16. Veins.
   - 17. Capillaries.
   - 18. Blood.
   - 19. Lymphatic vessels.
2. *Respiratory System:*
   - 21. Nares.
   - 22. Larynx and trachea.
   - 23. Bronchi.
   - 24. Lungs.
   - 25. Pleura.
3. *Digestive System:*
   - 31. Teeth.

32. Mouth, tongue, salivary glands, etc.
33. Pharynx and esophagus.
34. Stomach.
    341. Stomach contents.
35. Intestine.
    351. Small intestine.
    352. Appendix and cecum.
    353. Large intestine.
    354. Rectum.
    355. Intestinal contents.
36. Peritoneum, mesentery.
37. Liver.
38. Gall bladder, bile ducts.
39. Pancreas.

4. *Lymphatic System and Ductless Glands:*
41. Special lymphatic glands.
42. Thymus gland.
43. Thyroid gland.
44. Spleen.
45. Suprarenals.

5. *Urogenital System:*
51. Kidney.
52. Ureter.
53. Bladder.
54. Urethra.
    541. Contents of urinary system.
55. Penis.
56. Prostate.
57. Seminal vesicles, vas deferens and cord.
58. Testes, epididymis and tunica vaginalis.
59. Scrotum.

6. *Female Generative System:*
61. Vulva.
62. Vagina.
63. Uterus.
64. Tubes.
65. Ovaries.
66. Broad ligament.
67. Mamma.
68. Gravid uterus.
69. Ovum.
    691. Membranes.
    692. Placenta.
    693. Fetus.

7. *Nervous System:*
71. Dura Mater.
72. Pia mater.
73. Brain.
74. Medulla and pons.
75. Spinal cord.
76. Nerves.

77. Sympathetic system.
78. Eye.
79. Ear.

8. *Tegumentary and Muscular Systems:*
   81. Skin.
   82. Hair.
   83. Nails.
   84. Muscles and fascia.
   85. Cellular tissue.

9. *Osseous and Articular Systems:*
   91. Bones of the cranium.
   92. Bones of the face.
   93. Vertebrae.
   94. Sternum.
   95. Ribs.
   96. Bones of upper extremity.
      961. Scapula.
      962. Clavicle.
      963. Shoulder joint.
      964. Humerus.
      965. Elbow joint.
      966. Bones of forearm.
      967. Wrist-joint and joints of hand.
      968. Bones of hand.
   97. Pelvis.
      971. Os Innominatum.
      9711. Ilium.
      9712. Os pubis.
      9713. Ischium.
   98. Bones of lower extremity.
      981. Hip joint.
      982. Femur.
      983. Knee-joint.
      984. Bones of leg.
      9841. Patella.
      9842. Tibia.
      9843. Fibula.
      985. Joints of ankle and foot.
      986. Bones of foot.
   99. Skèleton as a whole.
   90. Fragments of bone.

0. *Regional:*
   01. Head.
   02. Face.
   03. Neck.
   04. Trunk.
      041. Thorax.
      042. Abdomen.
      043. Pelvis.
   05. Upper extremity.
   06. Lower extremity.

00. *Miscellaneous:*
    001. Microscopes.
    002. Weapons and missiles.
    003. Transportation and care of sick.
    004. Instruments and Materia Medica.
    005. Anthropology.
    006. Unclassified.

The minor or pathological classification is as follows:

1. *Abnormalities:*
    12. Teratomas.
    13. Miscellaneous.
2. *Circulatory Disturbances:*
    (Abnormal distribution of blood and lymph.)
    21. Anemia.
    22. Hyperemia.
    23. Hemorrhage.
    24. Thrombosis.
    25. Embolism.
    26. Infarction.
    27. Edema.
3. *Inflammations:*
    31. Parenchymatous degeneration or cloudy swelling.
    32. Cellular or catarrhal or desquamative.
4. *Infections and Parasites:*
    41. Pyogenic cocci.
    42. Bacilli.
    43. Spirilla.
    44. Yeasts and moulds.
    45. Protozoa.
    46. Vermes.
    47. Vermes.
    48. Arthropods.
5. *Granulomas and General Diseases:*
6. *Progressive changes:*
    61. Regeneration.
    62. Hypertrophy.
    63. Histioid tumors.
    64. Histioid tumors.
    65. Sarcoma.
7. *Retrogressive changes:*
    71. Atrophy, simple.
    72. Ulceration and abscess formation.
    73. Perforation and rupture due to disease.
    74. Dilation due to disease.
    75. Stenosis due to disease.
    76. Calculus formation.
8. *Wounds and Injuries:*
    81. Wounds, incised.
    82. Ruptures and lacerations.
    83. Fractures.
    84. Gunshot fractures.

85. Dislocations.
86. Foreign bodies.
87. Abortion.

9. *Specific Artefacts:*
Mechanical Lesions.

0. *General Supplementary.*

Classification for Comparative Anatomy Section:

1. Mammalia.
2. Aves.
3. Amphibia.
4. Pisces.
5. Insecta.
6. Vermes.

83. Gunshot wounds and fractures.
831. Contusions.
832. Lacerations.
833. Perforations.
834. Fractures.
8341. Partial fracture.
83411. Fissured.
83412. Grooved.
83413. Pond.
83414. Gutter.
83415. Penetrating without fissure.
83416. Penetrating with fissure.
83417. Perforating without fissure.
83418. Perforating with fissure.
8342. Complete fracture.
83421. Transverse.
83422. Oblique.
83423. Longitudinal.
83424. Comminuted.
83425. Double.
8343. United fracture.
83431. Fair union.
83432. Faulty union.
83433. Non-union.

Scheme of Arrangement of Instruments and Apparatus

1. Transportation; as ambulances, litters, stretchers, etc.
2. Hospital equipment; beds, bedding, portable baths, screens, stands, etc.
3. Operating room equipment; (not including instruments); tables, stools, etc.
4. Apparel equipment of surgeon, assistants and nurses; gowns, aprons, gloves, etc.
5. Diagnosis; instruments of precision; including Anthropometry.
6. Sterilization of instruments and appliances, mechanical, chemical, thermal.
7. Anesthesia.

8. Hypodermic medication.
9. Deep injection apparatus.
10. Transfusion and intravenous injection.
11. Paracentesis.
12. Cauterization.
13. To increase or diminish heat.
14. Bloodletting and cupping.
15. Counter-irritation.
16. General operative work; knives, forceps, retractors, etc., etc.
17. General operating cases.
18. Pocket cases.
19. Military surgery; first aid packages, pouches, chests, bullet probes, etc., etc.
20. Surgery of respiratory apparatus.
    Artificial respiration.
    Nose and naso-pharynx.
    Larynx and trachea.
    Lung and pleura.
21. Surgery of digestive apparatus.
    Mouth and throat.
    Dentistry, with cases.
    Oesophagus.
    Stomach.
    Intestines, including rectum.
    Hernia.
22. Laparotomy.
23. Surgery of kidneys.
24. Surgery of bladder and urethra; with cases.
25. Surgery of male generative; with cases.
26. Gynecology; with cases.
27. Surgery of bones and joints; with cases.
28. Ophthalmological surgery; with cases.
29. Otological surgery; with cases.
30. Obstetrical surgery; with cases.
31. Fractures and dislocations.
32. Plastic surgery, as skin grafting and harelip work.
33. Orthopedic.
34. Prosthetic.
35. Electro-therapeutics.
36. Photo-therapeutics.
37. Post-mortem work.

Under the head "Diagnosis" the following:

1. Microscopes and accessories.
2. Examination of blood, and pulse; as hemometers, hemocytometers, hemoglobinometers, etc.
3. Thermometers, sphygmometers, sphygmographs.
4. Respiration appliances, as tape measures, stethometers, cyrtometers, spirometers, manometers, stethoscopes, phonendoscopes, percussion hammers, pleximeters, etc.
5. Exploring needles and trocars.

6. Aesthesiometers.
7. Urinary analysis.
8. Bacteriology.
9. Location of cerebral fissures, etc.
10. Anthropometry, including dynamometers, calipers, measures of height, etc.

The number of specimens in the Museum June 30, 1916, was 47,313; comprising 13,089 pathological, 1,251 anatomical, 601 comparative anatomy, 12,916 microscopical, 4,014 miscellaneous, 293 provisional anatomy, and photographs (including about 11,000 negatives), 15,149.

Since the beginning of the collection in 1862 about 12,000 specimens have been donated to institutions, including colleges, hospitals, schools, boards of health, etc., or exchanged or discarded.

The number of contributors is 2,189.

In one way the most interesting collection in the Museum is that of gunshot wounds of bone. Nearly all of them are from engagements of the Civil War; mostly what are called recent fractures, others showing sequelae, especially osteomyelitis. Of course they were due to missiles used at that time, the round bullet, rifled or minie bullet, buckshot, cannon balls and fragments of shell. Besides the shot wounds there are fractures by swords and sabres, arrows and tomahawks; and a few by bayonets. Bayonet wounds, however, during the Civil War were relatively few.

Besides these fractures there are many others, due to falls, blows, railroad accidents, and many in which the cause is unknown.

Of the large number of what are called *wet* specimens, the most interesting are those from infectious diseases: typhoid fever, tuberculosis, yellow fever, pneumonia, smallpox, Asiatic cholera, leprosy, the plague, dysentery, diphtheria, pellagra, glanders, cerebrospinal meningitis, syphilis, and hospital gangrene.

Then there are specimens of embryology, human and comparative, wet specimens and models. Malformations and monstrosities, human and comparative, and this series also includes ectopic gestation. Animal and vegetable parasites; here may be mentioned the fungous foot of India.

There are many models, some in papier maché, others in plaster of Paris, and still others in what is called cathcartine, and the Baretta preparations. These models show normal and morbid anatomy. The Baretta preparations especially show the rarer forms of skin diseases. Some models, like the full-sized papier maché mannikins, are quite expensive.

There is a large collection of bones classed as prehistoric and pre-Columbian. Also a large collection of specimens illustrating dental

anatomy, both human and comparative, dental pathology and therapeutics.

A large series of transparencies showing especially the various forms of bacteria and protozoa and also photographs of the same.

A large collection of instruments, a series of microscopes, historical, probably the most complete in this country. Also accessories. Anthropometrical apparatus. Clinical thermometers, stethoscopes, ophthalmoscopes, sphygmomanometers, instruments for vaccination and hypodermic syringes, all historical. Biers' vacuum instruments, besides instruments generally. Also facsimiles of instruments found at Pompeii.

Medical military chests and pouches, ambulances and litters, missiles and weapons of different nations.

A series of Buchhold preparations in capsules, showing parasites and morbid anatomy. A series of rachitic pelves.

Sections of bones showing internal structure. Casts of skulls, racial. A series of frozen sections and another of dissections.

Diseases and injuries of viscera, eye, ear, nose, etc.

Calculi, biliary, renal, vesical.

A miscellaneous series comprising a cast of the fractured arm of the missionary explorer, Livingstone; cast of the brain of the deaf, mute and blind Laura Bridgeman; the injured parts in the case of John Wilkes Booth; the fractured leg of General Sickles; the skull and enlarged spleen of Guiteau, the assassin of Garfield, and many other specimens of general interest to the layman as well as the physician.

KIPLING ON JOHN HUNTER

By Lieut. Colonel F. H. GARRISON
Medical Corps, United States Army

ON FEBRUARY 14, 1923, the anniversary of the birthday of England's great surgeon-naturalist, John Hunter, was celebrated in the usual manner at the Royal College of Surgeons (Lincoln's Inn Fields, London). In the Annual Hunterian Oration, delivered by Sir Anthony A. Bowlby, the merits of the great military surgeon (Surgeon General of the British Army, 1790-93) were duly set forth, and at the dinner following, Rudyard Kipling responded to the toast "The Hunterian Orator" by the following tribute to the medical profession, which was, fortunately, printed in full in the *Times* newspaper (weekly edition) of February 22:

There is a legend which has been transmitted to us from the remotest ages. It has entered into many brains, and coloured not a few creeds. It is this: Once upon a time, or rather, at the very birth of Time, when the Gods were so new that they had no names, and Man was still damp from the clay of the pit whence he had been digged, man claimed that he, too, was in some sort a deity. The Gods were as just in those days as they are now. They weighed his evidence and decided that Man's claim was good—that he was, in effect, a divinity, and, as such, entitled to be freed from the trammels of mere brute instinct, to enjoy the consequences of his own acts. But the Gods sell everything at a price. Having conceded Man's claim, the legend goes that they came by stealth and stole away this Godhead with intent to hide it where Man should never find it again. But this was none so easy. If they hid it anywhere on Earth, the Gods foresaw that Man, the inveterate hunter—the father, you might say, of all hunters—would leave no stone unturned or wave unplumbed till he had recovered it. If they concealed it among themselves, they feared that Man might in the end batter his way up even to the skies. And, while they were all thus at a stand, the wisest of the Gods, who afterwards became the God Brahm, said: "I know. Give it to me!" And he closed his hand upon the tiny unstable light of Man's stolen Godhead, and when that great hand opened again, the light was gone. "All is well," said Brahm. "I have hidden it where Man will never dream of looking for it. I have hidden it inside Man himself." "Yes, but whereabouts inside Man have you hidden it?" all the other Gods asked, "Ah!" said Brahm. "That is my secret and always will be unless and until Man discovers it for himself."

"THE POOR BRUTE"

Thus does the case stand with Man up to the present. Consider for a moment the pathos of the poor brute's position. You all know the

common formula for him. "Born of woman, on woman designed to beget his like—the natural quarry of the Seven Deadly Sins, but the altar of an inextinguishable hope." Or, more scientifically (I regret I am not a scientific person), he might be defined as "An imperfectly denatured animal intermittently subject to the unpredictable reactions of an unlocated spiritual area."

And it is just this search for this unlocatable spiritual area, whether it be a growth or a survival, which has preoccupied man from that day to this. The priest and the lawgiver have probed and fished for it through all the ages; but, more than any other, through all the ages the leech, the medicineman, the healer has been hottest on its track. He has searched whenever he dared, openly or furtively, in safety or at the risk of his life. In the early days the astrologer-physician, as he called himself, dreamed that the secret of man's eternal unrest was laid up in the sun, moon, and stars; and consequently, since all created things were one in essence, that a universal medicament for man's eternal woes would be discovered upon earth. So he searched earth and the heavens for those twin secrets and sacrificed himself in the search as a matter of course.

Later, when the embargoes on the healing art were lifted, when at last he was permitted to look openly into the bodies of mankind, the nature of his dreams changed for awhile. He had found more wonders beneath his knife than earth or the planets had heretofore shown him. And that was barely ten generations ago. Once again, the surgeon, as he had become, renewed his search and, once again, sacrificed himself in the search as his passion drove him. There is no anaesthesia so complete as a man's absorption in his own job.

SCIENTIFIC RESEARCH

In the teeth of the outrageous, the absurd disabilities imposed on him, Man, the imperfectly denatured animal, who cannot trust the evidence of his own senses in the simplest matter of fact; whose evidence on the simplest matter is coloured by his own iniquities; Man, always the hunter, went up against the darkness that cloaked him and every act of his being, to find out what order of created thing he might be. He called it scientific research. It was the old quest under a new name. But, this time, the seekers who headed it, unlike the priest and the lawyer, admitted that they knew very little. Experience had taught them to be humble. For that reason, their knowledge was increased. They moved forward into areas of the body which, till then, had denied themselves to man's hand. They were turned back, without explanation, from other areas which, as yet, would tolerate no spying. They were bewildered by mysteries which some new marriage of observation upon accident, some predestined slip of the knife, resolved into mysteries profounder still! Is it any wonder that the old dreams came back! The dream of the essential unity of all created things—the dream that, some day, that which men call life might be led into matter which men call dead—the boldest dream of all, that eventually Man might surprise the ultimate secret of his being where Brahm had hidden it, in the body of man. And meanwhile their days were filled, as yours

are filled, with the piteous procession of men and women begging them, as men and women beg of you daily, for leave to be allowed to live a little longer, upon whatever terms. Is it any wonder, gentlemen of the College of Surgeons, that your calling should exact the utmost that man can give?

The Henry S. Wellcome Prizes

Competition open to all medical officers and former medical officers of the Army, Navy, Public Health Service, Organized Militia, U. S. Volunteers, and of the Reserves of the United States:

PRIZE FIRST: A GOLD MEDAL AND $300

PRIZE SECOND: A SILVER MEDAL AND $200

Competition for 1923 will be based on essays on prescribed subjects, as follows:

First Prize.—"Benefits Derived by Military Medical Science from Animal Experimentation."

Second Prize.—"The Training of the Medical Student for Service in Time of War."

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of the Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than **September 15, 1923,** and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title and address. Essays must contain not less than 5,000 nor more than 20,000 words, exclusive of tables. The envelopes accompanying the winning essays will be opened at the annual, or other, meeting, by the president, and the names of the successful contestants announced by him. The winning essays become the property of the Association and will be published in THE MILITARY SURGEON. The writers of the essays receiving "first honorable mention" will be awarded life membership in The Association of Military Surgeons, U. S.

CHEMICAL WARFARE AND ITS RELATION TO THE MEDICAL DEPARTMENT

By Lieut. Colonel H. L. GILCHRIST
Medical Corps, United States Army

I. DEFINITION

IN the late war the term "Gas" was used in connection with warfare to denote any of the several chemical agents used in combat, whether gases, liquids or solids. Now the term employed for designating chemicals and chemical compounds used in war is "Chemical Agent."

The term chemical agent includes those chemicals and chemical compounds, whether gases, liquids or solids used in warfare for lethal harassing or neutralizing effect against personnel, and dependent primarily for effectiveness on direct chemical activity; those agents used for incendiary, corrosive or spoliation effect against shelter, supplies and material, and for screening or obscuring operations in the field. Chemical agents differ materially from other projections against the enemy in that they are not dependent on momentum or disruptive force for effect (as, e. g., H. E., shrapnel, or rifle fire), but on direct chemical action. Their projection on a target is characterized by continuity of pattern; they are not momentary agents, all being characterized by some degree of persistency, and the quality of diffusing into the surrounding air and enveloping everything within the area of efficient concentration.

II. CLASSIFICATION

The several chemical agents fall into different classifications based upon their

A. Physical State

(1) Gases, (2) liquids, (3) solids. This classification is based upon physical condition at ordinary temperature likely to be encountered in the field.

Upon these qualities depend to a material extent the several methods of projection, e.g., gases, such as chlorine, which exert a relatively high vapor pressure, can be liberated from cylinders forming gas clouds which are carried along by the wind; while liquid agents such as mustard must be dispersed by an explosive charge sufficient to effect atomization and effective vaporization; other liquids of different characteristics require different degrees of explosive force for effecting dispersion.

Solids, such as diphenylchlorarsine can be effectively dispersed by an explosive charge completely pulverizing the agent; these same

agents also can be effectively put over by volatilization, due to the heat generating mixture of the so-called candle.

B. Tactical Uses

Class 1, *Direct Casualty Agents:* Includes those chemical agents which produce fatalities or sufficiently serious injuries to necessitate evacuation. Effectiveness is generally immediate, except in the case of vesicants.

Class 2, *Harassing Agents:* Includes those chemical agents which produce a lowering of physical strength and morale either directly from irritating and debilitating effects or indirectly by necessitating continued wearing of mask or adoption of other means of protection.

Class 3, *Neutralizing Agents:* Includes those chemical agents used for rendering terrain untenable.

Class 4, *Screening Agents:* Includes various smokes used for screening and obscuring purposes.

Class 5, *Incendiary and Corrosive Agents:* Includes those chemical agents which produce direct damage to enemy shelter, matériel and supplies, including rendition of food unfit for consumption.

MEDICAL ASPECTS OF CHEMICAL WARFARE WEAPONS

Effects of War Chemicals on the Human Body

(*a*) *General.*—The symptoms produced by war chemicals depend to a certain extent upon the chemicals and concentrations used, the length of exposure, physical condition of the person affected and the manner in which he conducted himself after being exposed. The various chemicals used in warfare have an especial effect on some particular part of the body and based upon this they are classified accordingly. It must be remembered, however, that several chemicals, each affecting different parts of the body, may be used at the same time, thereby producing a variety of symptoms. According to their principal action on the body, war chemicals are classified as follows:

Action	*Gas*
(1) Lung Irritants	Chlorine
	Phosgene
(2) Sternutators	Chlorpicrin
	Diphenylchlorarsine
(3) Lachrymators	Brombenzylcyanide
	Chloracetophenone
(4) Vesicants	Yprite (Mustard Gas)
(5) Direct Poisons of the Nervous System (Vincennite)	Hydrocyanic Acid Gas
(6) Gases interfering with the Respiratory Properties of the Blood	Carbon Monoxide.

(*b*) *Lung irritants.*—The main symptoms of poisoning by these lung irritants may be summed up as follows:

1. Catching of the breath, choking, and coughing immediately upon exposure to gas.

2. Inability to expand the chest in a full breath after removal from the poisoned air.

3. Vomiting, hurried shallow respiration or breathing, sometimes coughing with an abundant expectoration, pain is felt behind the sternum or breastbone and lower part of the chest.

4. The patient gets blue in the face, or in severe cases, may go to the gray condition which is very serious.

(*c*) *Lachrymators.*—These are tear-producing chemicals and in concentrations as low as .00015 milligram per liter produce an irritant action on the eyes, causing a profuse flow of tears, accompanied with pain and impairment of vision.

(*d*) *Sternutators.*—These are sneezing gases producing a moderate irritation of the mucous membranes of the nose and throat.

(*e*) *Vesicants.*—This group of chemicals is distinguished from the irritants by the persistency of their action. Ground sprinkled with them may be dangerous for days or weeks following. Dichlorethyl-sulphide, or mustard gas, is the best vesicant known. The main features of mustard gas poison may be summed up as follows:

1. Delay of the irritant effect for several hours followed by a comparatively slow development of the various inflammatory reactions.

2. Vomiting and a sense of burning in the eyes with discomfort in the throat, hoarse cough, and pain behind the breastbone.

3. Intense inflammation of the eyes which may cause temporary blindness, due to the swelling of the lids.

4. Burning of the exposed skin surfaces, and of most areas of the body, followed by blistering and staining.

5. Inflammation of the mucous membrane of the respiratory tract with the secondary development of infective bronchitis or septic bronchopneumonia.

(*f*) *Smokes.*—While most of these substances are more or less poisonous, the degree of their poison is far below that of the other chemical warfare agents, and in the concentrations which are likely to be encountered in the field, they are negligible.

(*g*) *Phosphorus.*—Two forms of phosphorus are used for military purposes; the white and red. Taken internally in small amounts, they act as violent poisons and when coming in contact with the skin produce severe burns.

The prevention and first aid treatment of casualties produced by war chemicals.

Prevention.—Inasmuch as all war chemicals are heavier than air and therefore naturally settle in shell holes and depressions in the earth and in dugouts, trenches, etc., a most important measure in the prevention of casualties is, when practicable, to seek high ground and the open in gassed areas in order to escape from the contaminated air.

The most effective way to prevent the deleterious effects of war chemicals on the eyes, face and respiratory system in the prompt use of the gas mask. In the absence of a gas mask the prevention of the breathing of toxic atmosphere may be accomplished to a certain extent by the following emergency means: Breathe through a handkerchief saturated with urine or a liquid of some kind. If impossible to obtain a handkerchief, an old sock, piece of cotton, or a newspaper may be used for the same purpose. If impossible to obtain these materials, earth moistened in the above manner can be scooped up and placed over the face.

GENERAL TREATMENT OF CHEMICAL WARFARE CASUALTIES

In view of the multiplicity of the symptoms produced by warfare chemicals, together with their varying degrees of severity, it is almost impossible to define a prescribed line of treatment for casualties suffering from the effects of these materials. As a result, every case must be treated on its merits. In all cases, however, the following fundamental rules are applicable and should be strictly adherred to when possible.

1. Remove the patient or suspect to a pure atmosphere.

2. Consider all persons who have been exposed to warfare chemicals and who present any signs of contamination, as casualties until proven otherwise.

The treatment of all chemical warfare casualties should begin at the very front line and continue all along to the rear.

IRRITANTS

In considering the treatment of these cases, the grave issue to be met is pulmonary oedema or the accumulation of fluid in the lungs, which condition interferes with oxygen want, the contamination of the blood, and the overloading of the right heart. The principles involved in the treatment of these cases may be summed up as follows:

1. Absolute rest for the purpose of saving oxygen in the body.

2. Body warmth for the same purpose.

3. The administration of oxygen to take the place of that which cannot be inhaled naturally.

4. Venisection or bleeding the patient to combat the oedema and relieve the right heart.

5. Endeavor to rid the body of accumulated chemical products.

6. Adopt all means to prevent secondary infection; cleanliness.
7. Make the patient comfortable.
8. The administration of hot coffee as a stimulant to the heart.

VESICANTS

When it is known that vesicants or blistering chemicals are present, measures (in addition to use of the gas mask) to prevent their action should, when practicable, be taken as follows:

(*a*) Remove all clothing and equipment.

(*b*) Disinfect infected or exposed areas in the case of the hands. The simplest treatment, if the hands are dry, is to rub them with dry chloride of lime. This method cannot be employed on the more delicate parts of the skin. These parts should be washed and bathed with hot water and rinsed off with bicarbonate of soda solution. The application of coal oil or kerosene to the parts is very helpful. The treatments administered for ordinary burns may be used successfully in these cases. The eyes are disinfected by bathing with a solution of bicarbonate of soda 2 per cent which should be repeated several times a day. The eyes should never be bandaged for the reason that it causes a retention of the secretions. The mucous membranes of the nasal passages should be sprayed with a strong solution of bicarbonate of soda.

(*c*) The use of protective gloves and clothing by all who come in contact with mustard gas patients should be strictly observed. In the treatment of these cases, like those of the irritant group, judgment and common sense are required. Soldiers and others coming in contact with animals exposed to the fumes of mustard gas must always bear in mind that the hair on these animals retain the gas and may be the means of producing severe gas casualties among those coming in contact with them. In all cases the utmost precautions must be observed and those caring for these animals should always be gloved and when possible protected with gas proof clothing.

When possible the animals should be subjected to washes of lime water after departure from the contaminated atmosphere.

STERNUTATORS AND LACHRYMATORS

For the ordinary cases no treatment is necessary. The removal to gas free atmosphere will soon accomplish the desired results.

PHOSPHORUS POISONING

Phosphorus burns come under the same category as burns caused by acid and alkali and are of persistent character. With severe burns shock is always present. The treatment is difficult inasmuch as healing

does not take place until the sloughs entirely disappear, which may require weeks or months. Shock and pain must be relieved. Hot coffee and stimulant for the former, opium for the latter. The burned areas should be cleansed with some mild antiseptic before treatment is administered. The treatment has proven highly efficacious for burns of this character.

TREATMENT FOR CARBON MONOXIDE POISONING

Patients suffering from carbon monoxide gas poisoning should be moved immediately to a clear atmosphere. They should be wrapped in blankets and kept at absolute rest, thereby retaining the oxygen in the body. Oxygen should be administered as soon as possible. If the breathing is shallow, artificial respiration together with friction of the lower limbs should be resorted to.

TREATMENT OF HYDROCYANIC POISONING

The action of hydrocyanic acid gas is so rapid but little can be accomplished in the line of treatment.

DEGASSING CLOTHING AND OTHER MATERIALS

The degassing of clothing and other materials which have been contaminated with war chemicals, particularly with mustard gas, must be accomplished with caution by those employed in the work. They must use gas masks, rubber gloves and protective clothing when gas is present or is suspected. There are two general methods of removing poisonous gases from clothing and other materials, viz: chemical and physical.

(*a*) The chemical methods consist in soaking the articles, when practicable, in a solution of one of the following: chloride of lime, chlorine, alkaline soap, or sodium bicarbonate.

(*b*) The physical methods consist in employing one or more of the following agencies: moist heat, running water, steam under pressure, steam not under pressure, sunlight, and open air. The best method is sterilization with steam. Clothing and materials subjected to steam (either under pressure or not under pressure) for half an hour are rendered free from war chemicals.

SECTION III

MEDICAL ORGANIZATION FOR TREATING CASUALTIES SUFFERING FROM THE EFFECTS OF WARFARE CHEMICALS

A medical organization capable of meeting the special requirements expected of it in handling casualties resulting from chemical warfare must be a strong coordinating body embracing all of the divisions of

relief including those in the combat zone, along the lines of communication, and at the base. Every officer and enlisted man of the Medical Department connected with the various relief organizations of the Army should have a thorough knowledge of the latest treatment of chemical warfare casualties.

Relief Stations: All of the relief stations now contemplated in the scheme of organization will be augmented by the Medical Department with special equipment and when necessary additional personnel for the purpose of treating casualties produced by chemical warfare. These stations are as follows:

A. Chemical Warfare Sections of Battalion and Regimental Aid Stations.

B. Chemical Warfare Sections of Collecting Stations.

C. Chemical Warfare Sections of Hospital Stations.

D. Hospital stations established in emergencies by medical regiments of corps or armies for the exclusive treatment of chemical warfare casualties, particularly when in large numbers and when transportation further to the rear is contraindicated.

CHEMICAL WARFARE SECTION OF REGIMENTAL AND BATTALION AID STATIONS

In order to curtail to a minimum the number of relief stations in the zone of activities and to avoid duplication of personnel and equipment, Chemical Warfare sections will, when occasion demands, be established in connection with battalion and regimental aid stations for the purpose of treating casualties suffering from the effects of exposure to warfare chemicals.

The number of these sections and their size depends upon the probable requirements. As a rule they should be established as near the front lines as conditions will permit and should be protected against the effects of warfare chemicals and provided with the essential equipment for administering first aid to those suffering from the effects of this method of warfare. At these stations patients, especially those suffering from lung irritants, should be kept at rest. As a rule, they should lie down and be evacuated in a recumbent position. If vesicants have been used, the patients' clothing should be removed, their hands disinfected with chloride of lime, and their eyes bathed with a 2 per cent solution of sodium bicarbonate.

Treatment to be Administered at Aid Stations

1. Retain masks on patients till danger is over.

2. Patients should avoid unnecessary movements, especially if suffering from lung irritants.

3. Inhalations of ammonia by litter bearers to all cases with dyspnoea.
4. Loosen or remove clothing; remove equipment.
5. Encourage vomiting by tepid salt water.

Collecting Stations

The Chemical Warfare sections of these stations are operated in connection with the regular collecting stations established by the Medical Department. As a rule these stations are established from 1,500 to 2,000 yards back of the front line, but conditions of the terrain and other circumstances may necessitate their establishment further to the rear. The collecting stations, like the aid stations, must be in the chemical warfare zone which requires extra equipment, etc., to render them proof against these agencies. It is inadvisable to establish them in underground cellars, dugouts, or valleys, for the reason that chemical warfare gases, which are heavier than air, render these places extremely dangerous, due to the stronger concentrations of gases that collect in them, as a result they should be established above ground and in the open.

Chemical Warfare sections of collecting stations are established by the Collecting Companies of the Medical Department, and if in zones liable to be bombarded with warfare chemicals their regular equipment should be augmented by additional equipment to render them gas proof together with sufficient supplies for administering treatment to chemical casualties, which should be obtained from the Army Medical Supply Depot. Extra personnel can be detailed with these sections, either from reserve medical units at the rear, or by sending up gas medical teams, each consisting of one medical officer, two trained nurses and three enlisted men, all thoroughly instructed in the best methods of handling gas casualties.

At these stations every effort should be made to sift out the slightly gassed or non-gassed, thus permitting their early return to the front lines and increasing the fighting forces, and at the same time preventing able-bodied men being evacuated to the rear.

Collecting station sections for handling chemical warfare cases should be divided into the following departments:

(*a*) Receiving.
(*b*) Forwarding.
(*c*) Bathing.
(*d*) Departments for slightly gassed.
(*e*) Departments for seriously gassed.
(*f*) Departments for observation.

These sections should remain in operation as long as chemical warfare casualties are occurring in the front lines.

Chemical Warfare casualties at these collecting stations are evacuated via the ambulance stations to the hospital stations in the rear.

The following treatment should be administered chemical warfare casualties at collecting stations:

1. Keep patients warm and in the recumbent position. Remove their contaminated clothing.
2. Administer oxygen if possible.
3. Treat the eyes of mustard gas cases.
4. Retain shock cases as long as possible.
5. Bleed cyanosed cases when necessary.

Sorting Sections of Hospital Stations

Sorting sections or what were designated as triages during the war, are the most important of any of the relief stations. Important for the reason that it is at these sections that the patients are sorted for final disposition.

Non-gassed or doubtful cases of chemical poisoning passing the aid stations and collecting stations for lack of definite diagnosis, should be carefully examined at these stations until they can be positively diagnosed, thus enabling rational disposition. As a rule, these sections are established at the entrance to hospital station groups, about four to five miles back of the firing line and out of the gas zone.

Here baths are given and the bathing is also supplemented by the disinfection of clothing and in exceptional cases by the issuing of clean clothing.

If occasion demands, an entire hospital station may be designated for the exclusive care and treatment of gas casualties, and should be divided into special departments to meet the exigencies of the case and equipment should include:

(*a*) A shower bath apparatus.

(*b*) An apparatus for the disinfection of clothing and equipment.

(*c*) Equipment for special therapeutic treatment, including oxygen cylinders and apparatus for administering oxygen.

This is practically the first station where men exposed to the action of vesicant gases can receive thorough baths and changes of clothing.

Degassing Stations

These are motorized mobile stations, organized and equipped for the purpose of administering hot baths, sterilization of clothing or issuing new clothing when occasion demands to large bodies of troops who have been operating over terrain contaminated with mustard or other vesicant chemicals.

Such stations are established only as a preventative (prophylactic) measure. They are not medical units but function under medical supervision.

Hospitals

One or more evacuation hospitals may be exclusively set aside for the reception and treatment of chemical warfare casualties when the hospital stations of division, corps, and army are proving insufficient to meet the need. Here more protracted and thorough treatment can be given. When evacuation hospitals are designated for this purpose they should procure from the Army Medical Supply Depot the special equipment needed for carrying on this class of work. Gas teams from the specialist group are also assigned as the occasion demands.

Ambulance Companies in Chemical Warfare

All ambulance companies operating in zones where chemical warfare is used should be prepared to administer and transport chemical warfare casualties. To fulfill this function, in addition to their regular equipment, each ambulance should carry an extra supply of blankets, and as many oxygen bottles as there are patients to be carried. These bottles should be of 1-litre capacity.

To the cap of each bottle there should be attached a small rubber catheter with stop cock. When in use, the bottles are placed between the blankets, the end of the catheter is passed into the nasal-pharynx of the patient and the gas turned on, thus administering to him a sufficient supply of oxygen at a time when most needed.

At the end of each journey or trip, ambulances which have carried patients exposed to vesicant gases should be thoroughly disinfected.

RULES CONCERNING CHEMICAL WARFARE WHICH EVERY OFFICER AND ENLISTED MAN SHOULD KNOW

1. Every medical officer is responsible that the men under his command are carefully instructed in defense measures against gas that they will properly protect themselves and intelligently aid those who have become casualties from exposure to gas.

Familiarity through continuous training with the means supplied to combat gas attacks, and with the procedure necessary for the successful relief of those affected by poisonous gas, is required of all officers and men.

2. Proficiency must be acquired in the quick adjustment of respirators and masks, especially as concerns holding the breath both at inspiration and expiration. A deep breath may fill the lungs with air contaminated with gas with disastrous results.

3. Care must be taken that men sleeping in closed spaces are not gassed by long exposure to small quantities of gas unknowingly brought in on their clothing or equipment.

4. No man affected by an irritant gas, however slightly, will be allowed to walk to a dressing station, or to exert himself physically in any way.

5. Food and water supplies must be carefully and completely covered to prevent contaminating from gas. Food which has been exposed to gas must be destroyed.

6. It is forbidden to use water from shell holes for drinking, cooking, washing or bathing.

7. Do not put the fingers in the eyes or mouth, scratch the skin or touch the genitals or anus, and thus risk contamination with mustard gas, unless the hands have been disinfected.

8. Mustard gas is promptly diffused in the presence of heat. Therefore no man wearing or bearing contaminated clothing will enter any heated room or dugout.

9. The use of latrines in an infected zone should be immediately forbidden until they have been disinfected and washed with chloride of lime.

10. Those who handle gassed cases and their discarded clothing and equipment must be properly protected by gas masks, anti-gas clothing, and oil cloth mittens and be provided with tongs and pincers.

THE FUTURE OF THE CITIZENS' MILITARY TRAINING CAMP

By Lieut. Colonel E. L. RUFFNER
Medical Corps, United States Army

THERE has recently been put forth a special effort by the Government to bring before the people of our country the necessity and the agencies now available for the physical development of our young manhood. At the conference on Training for Citizenship and National Defense, November, 1922, held in Washington, many societies were represented, together with the War Department General Staff. An organization was effected, committees appointed, and a systematized plan of action for the future outlined. It is to be noted that all committees favored the C. M. T. C. method of training.

The C. M. T. C. is one of the most important agencies which the Government can now use to accomplish the purpose of both the physical development of its youth and the making of good citizens. It can be approached or told to the public in two ways, viz., either placing the greatest stress and making the talking points the physical training, with the benefit, pleasure and play which comes with it, or the training from the military point of view. It is the object of this paper to approach it purely from the physical training point of view, making the training along military lines of secondary importance. These training camps are in competition with summer camps all over the country: Boy Scout training activities, Y. M. C. A. summer camps, and camps of many private and church organizations. These all require the payment of a fee covering board, etc., plus railroad fare to and from.

In the C. M. T. C. all expenses are paid by the Government, and that is the first great talking point. Mothers and fathers are much more easier approached with the idea of the careful, supervised training to be given their sons, the swimming, outdoor sports, and supervision of their life for thirty days, than to approach them, first and foremost, with the drill, discipline and regularity of a military camp. True, there was a very equable allotment of time to both the military and physical training at Camp Devens last summer, but the point to be made is in the talking points for students to come. It is felt that this approach of the subject is not the one usually used by many at this time.

During the month these students are at camp they all receive a wonderful systematic physical training, persistent instruction in how to properly carry themselves (the position of the soldier), continuous

example of neatness, regularity, precision, obedience, and to take into account the other fellow's point of view.

A natural question arises in the selection of candidates for the C. M. T. C., as to why the age of seventeen years is chosen. It would seem to me more a question of physical development than age, except for the fact of the association of a younger boy with those older than himself. Many boys sixteen or even fifteen are well within the minimum requirements from a physical point of view. Would more harm be done, or in fact would any harm be done, to a growing boy if he had the requisite height, weight and chest although not seventeen years of age? Does not his height, weight and chest development show that he is as mature physically as the boy with the greater number of years? Is not his heart as vigorous? Of course the minimum physical requirements should not be dropped or lowered. Experience has shown that boys with these can do the work, but they should under no circumstances be lowered. It is not thought by me that for the thirty days and with the close supervision now carried on the younger boy would in any way suffer morally by his association with older boys at these camps, and even though not seventeen years of age, but if seventeen or over in physical development, the physical training would not injure him. The only possible objection might be that he would be homesick and not be able to overcome it.

There is no constituted authority over these students. True, they take an oath, but it is only by example and respect born from it that the company commander and noncommissioned officers can accomplish anything. Leadership by the company commander is the keynote of the whole structure. If he has it, his youthful students respond. His company is good. If not, trouble is sure to arise. It is a wonderful opportunity for an officer to test himself as to his leadership, and for his superior officer to make a just estimate of him.

During the month of August, 1922, as senior surgeon at Camp Devens, Mass., during the training of the C. M. T. C. of the First Corps Area comprising the New England States, the opportunity was given to study the result of this activity. The results obtained at that camp were astonishing. It would seem to those of us interested in this effort that it is the most beneficial help our Government has ever offered to its youth. Its need cannot be questioned. The result of the draft showed that New England was especially low in the physical development of the men presenting themselves. The lack of discipline, of respect for authority, and of respect for their elders among our young manhood is painfully apparent throughout the country.

One great benefit derived is the compulsory inoculation against typhoid and smallpox called for before admission to this camp.

During this camp 2,582 young men reported, between the ages of seventeen and thirty-four. The physical examination was conducted practically continuously until completed. Two teams were organized, each calling for the same personnel. Method of examination: Two series of rooms were chosen, one on each side of a long corridor. Painted white arrows showed which way the stream should flow. Painted footprints showed where each student should stand. Each team required three dental officers and nine medical officers, each with a Medical Department man as clerk. They occupied the following stations in the order named: Height, weight and chest by dental officer; eye, medical officer; general surgery, i.e., bones and joints, two medical officers; throat and lungs, two medical officers; teeth, dental officer; ear, medical officer; neuropsychiatry, medical officer. Each station put its findings on the physical form and finally, either myself or a senior medical officer, saw each student and his card and passed or rejected him. From seventy to eighty men an hour could be passed by one team. When the stream was slow, each team worked half a day, and a portion of the team was kept on duty during the night. In this way all were examined well within the time given. At the time of the final examination I could invariably pick out the students of the previous year by their carriage and appearance.

On the supposition that young men of their age would not have many serious physical defects, I was rather lenient in making rejections. Only forty-three were held out. The following were causes of rejection:

Underweight	7	Otitis media	1
Flail joint (elbow)	1	Scabies	3
Hernia	10	Organic heart	7
Flat foot (rigid)	3	Mental inferiority	1
Defective vision	9	Constitutional psychopathic state	1

Showing that my judgment was correct, only two doubtful cases arose during the month, and these during the last week.

An excellent physical program was carried out, including swimming, baseball, and many other games, and physical exercise en masse every morning. Lectures in personal and sex hygiene were given to the entire student body.

Medical care was rendered first in the dispensary established at the camp itself, which had an observation ward of four beds, a dental clinic, and a room for minor surgery. A dentist and a medical officer, together with a sergeant and three Medical Department men were always on duty, and an ambulance and driver on duty at the large drill ground for every drill.

Nine medical officers of the Officers' Reserve Corps, one for each battalion, were on duty during the entire camp. All serious cases

were sent to the station hospital, where one hundred beds were available in a wing reserved for students only. Very serious cases were sent to the hospital at Fort Banks. It was only necessary to send two students to Fort Banks.

The following physical findings are of interest (see also table, opposite page):

Age	*No.*	*Height*	*No.*	*Weight*	*No.*
17	1,394	59″	2	90	0
18	548	60	6	95	2
19	255	61	17	100	52
20	131	62	47	110	88
21	87	63	68	115	210
22	46	64	131	120	263
23	19	65	238	125	337
24	20	66	352	130	346
25	16	67	424	135	287
26	7	68	257	140	225
27	6	69	385	145	148
28	0	70	250	150	107
29	1	71	165	155	87
30	1	72	122	160	50
31	0	73	49	165	37
32	3	74	15	170	26
33	3	75	10	175	20
34	2	76	1	180	6
				185	11
				190	3
				195	2
				200	1
				205	2
				210	1
				215	1
				252	1

Weight by groups showed that the largest single group was:

392 students in the 130-pound group, 129 of them being 67 inches in height.
323 students in the 135-pound group, 100 of them being 68 inches in height.

Height by age group showed that the largest single group was:

1,394 students, aged 17; 217, 67 inches; 209, 68 inches.

Weight by age group showed that the largest single group was:

346 students, 130 pounds, 190 being 17 years of age.

All students had their weight taken the day before camp closed. These figures after thirty days of very strenuous activity and graduated physical exercise are interesting.

Neuro-psychiatric findings were of great interest. A rapid questioning of all candidates was made at one of the stations during the preliminary physical examination to show mental alertness, precision, coordination of thought and action. Arbitrary numbers up to 12 were used in grouping, using 8 as the number necessary for standard.

GAINS IN WEIGHT, LOSSES IN WEIGHT AND STATIONARY WEIGHTS AMONG 2,539 STUDENTS AT CITIZENS' MILITARY TRAINING CAMP, CAMP DEVENS, MASS., BETWEEN AUGUST 1 AND AUGUST 27, 1922

Age	Gained			Lost			Stationary		Total No.
	No.	Per cent	Average gain, lbs.	No.	Per cent	Average loss	No.	Per cent	
17	842	69	5.6	261	21	4.1	112	10	1,215
18	376	71	4.5	107	20	3.3	47	9	530
19	160	70	4.9	49	21	3.3	19	9	228
20	83	68	5.0	33	27	2.5	6	5	122
21	53	68	4.6	16	20	5.0	9	12	78
22	29	67	6.0	11	26	4.3	3	7	43
23	10	55	8.2	7	39	3.9	1	6	18
24	12	63	3.7	4	21	5.0	3	16	19
25	10	77	8.0	1	8	3.0	2	15	13
26	4	80	3.0	1	20	10.0	0	0	5
27	2	50	....	1	25	1.0	1	25	4
29 32 33 34	5	63	1.6	0	0	0	3	37	8
Total.....	1,586	....	5.0	491	....	3.9	206	....	2,283

Average gain per man of those gaining in weight, 5 pounds.
Average loss per man of those losing in weight, 3.9 pounds.

Greatest individual gain—37 pounds, one aged 17, one aged 19.
Greatest individual loss—37 pounds, aged 17.

1,394 students, 17 years of age, height varied from 58 to 75 inches, weight 83 to 205 lbs.
548 students, 18 years of age, height varied from 59 to 74 inches, weight 95 to 185 lbs.
255 students, 19 years of age, height varied from 60 to 76 inches, weight 100 to 210 lbs.
131 students, 20 years of age, height varied from 58 to 75 inches, weight 100 to 185 lbs.
87 students, 21 years of age, height varied from 63 to 74 inches, weight 110 to 175 lbs.
46 students, 22 years of age, height varied from 62 to 75 inches, weight 110 to 185 lbs.

All above were fair and good; all below were substandard, poor and very poor. Two hundred and forty-nine were judged substandard in this test, 60 being very poor, 189 poor; 2,290 were standard, 1,205 being fair, 1,085 good.

Grouping as to education showed:

114 failed to complete grammar school; 43 aged 17; 51 aged 18; 16 aged 19; others above that age.

276 completed grammar school; 145 aged 17; 54 aged 18; 39 aged 19; others above that age.

1,580 entered high school; 1,050 aged 17; 314 aged 18; 100 aged 19; others above that age.

448 completed high school.

102 entered college.

All candidates were graded as to general physical condition, agreeing with table of standard.

Grade 1, very poor; grade 2, poor; grade 3, fair; grade 4, good.

Grade 1 showed 11; grade 2, 155; grade 3, 1,119; grade 4, 1,242.

Class B, candidates having some physical defect other than disproportion of height or weight for their age, numbered 905.

The Alpha Test was given, but too late in the training to have been of much service.

After this camp had been in progress for about ten days, a request was made by me, through the commanding officer, to have the names submitted by the company commanders of all students who were not keeping up with the companies from mental or physical cause. Ninety-seven names were submitted and others added from day to day. These students were formed into a Special Instruction Company, under special officers and noncommissioned officers. Four groups were apparent at once. Students passed through these groups if possible and finally back to the company. The large majority quickly responded to their individual instruction, showing that some slowness or misunderstanding had called the attention of their company commanders to them.

Groups 3 and 4 were the only groups finally of interest.

Group 3—number in group, 22; number in group of foreign birth, 2.

Reason for being in this group as found by medical officer:

9 slow mentality, grammar school, Alpha rating D.

10 poor physical condition with slow mentality, grammar school, Alpha rating D.

2 first grade high school, Alpha rating B. No apparent cause for their poor showing.

1 high school graduate, Alpha rating A. Although he was so slow that he could not keep up with his company.

Group 4—Poor physical development only, number 28.

This group composed of students showing lack of physical development due to insufficient exercise and incorrect posture.

Group 3 showed, at the end of the month's training under their special instructors, that they would never become proficient in a military way, but the benefit to them of their little training cannot be measured in dollars and cents. It is the first time in their lives that some of them ever had any personal instruction, and for this time at least, they had received something tangible from their own government.

Group 4 were all greatly benefited, and no reason exists why they could not take further training. It is felt that these students received the greatest benefit of any in camp and that it is largely for them that these camps are instituted, in my judgment.

Upon these students leaving camp, letters were written to their parents, advising them of the physical defects existing and measures recommended which would benefit each.

If the young men and the parents of the young men can have this agency brought to their attention, be made to believe in it, any young man starting at the age of seventeen, and giving only one month a year for four years, will be wonderfully benefited, first as regards his physical training, just at the right time for it; next, as regards his ideas concerning authority, both of his parents, the law and his own government. He will be broadened in his conception of "the other fellow's point of view" and will graduate a real man and a much better young citizen, to decide the right course of action to be taken by his own country in any crisis.

CARREL-DAKIN TREATMENT—AN IMPROVEMENT IN ADJUSTING THE TUBES IN SUPERFICIAL WOUNDS

By HOWARD LILIENTHAL

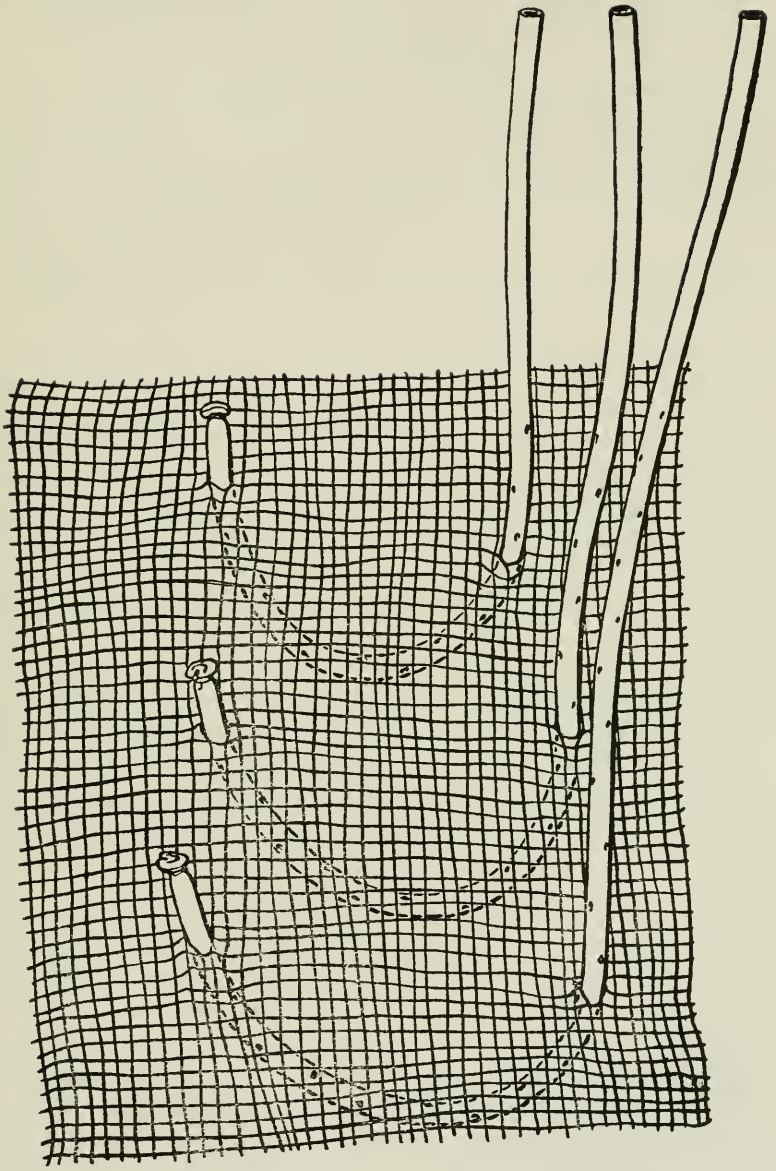
Formerly Lieutenant Colonel, M. R. C. (A. E. F.)

(With one illustration)

IN THE treatment of large surface wounds by the Carrel-Dakin method it has always been a difficult matter to distribute the tubes so as to get the greatest irrigation advantage and at the same time keep each tube in place with no shifting when the patient moves about. To counteract this tendency to slip, Carrel originally advised the use of tubes covered with Turkish toweling, running several strands of thread through each tube, spreading them out upon the wound and holding them in place by gauze. This, however, has not proved quite satisfactory because the Turkish toweling becomes clogged and has to be removed before each using; nor do the strings prevent the disarrangement of the tubes when the individual is restless.

I have recently been treating a patient who had an enormous granulating wound of the chest wall in which there was a most stubborn infection by the hemolytic streptococcus. The dressings were extremely difficult and complicated, the patient a nervous, sensitive woman. Finally, the nurse in the case, Miss Rebecca Hervey, who had had a large surgical experience with the British forces during the war, and who had received a royal decoration, hit upon the following interesting and useful expedient for applying the Carrel-Dakin treatment in this case.

The tubes were woven into a piece of paraffined netting (which goes under the trade name of parrasined gauze), as illustrated (see opposite page). This fabric is stiffened by the paraffine so that it holds its form and it does not adhere to the granulations. The netting with the tubes fixed in position is simply laid in its proper place upon the wounded surface, is covered with gauze and bandaged, leaving the ends of the tubes free for the irrigation with Dakin's solution. The woman is able to be up and about, and during many weeks the method has proved itself of great value and comfort. The idea is presented here so that it may be popularized in the surgical profession.



TULARÆMIA[1]

Tularaemia in the Washington (D. C.) Market[2]

By EDWARD FRANCIS

Surgeon, Hygienic Laboratory, United States Public Health Service

IN JANUARY, 1923, the rabbits which were being offered for sale over the counter in the Washington market were examined for evidences of tularæmia. Seven were found, the livers of which on gross examination showed numerous small foci of necrosis indicative of tularæmia. Confirmation was obtained by inoculating a piece of each suspected liver into a separate guinea-pig, from which animal a pure culture of *Bacterium tularense* was obtained in all seven instances.

The market man (E. N.) at whose stand the infected rabbits were found removed the livers from all seven with his bare hands, as he had probably done with other infected rabbits. That he suffered no ill effects at this time from the manipulation was evidently due to an immunity to tularaemia, acquired in the same way in the previous year. In November–December, 1921, while working at the same rabbit stand, he became ill with fever, suffering prostration and painful enlargement of the right axillary glands, which lasted over a month; he thinks that he had also at that time a sore on one of the fingers of the right hand.

In June, 1922, examination of his blood serum revealed agglutination of *Bacterium tularense* in dilution of 1 : 100, a reaction which was still present in March, 1923. Thus, both the diagnosis of the original condition and the existence of an immunity persisting for a year are established. It is interesting to note that this man diagnosed his own case, telling his family physician that he had "rabbit fever" and that the condition was well known among market men.

MARKET INFECTIONS IN MAN

1. *Cincinnati, Ohio.*[3]—Three human cases of tularæmia have been reported from Cincinnati, in which the site of infection was the left eye. In each case *Bacterium tularense* was recovered in cultures from

[1] The disease is so named from the causative organism, *Bacterium tularense*, found in the blood, which, in 1912, was discovered by McCoy and Chapin as the cause of a fatal epidemic prevalent among the ground squirrels in Tulare County, Calif. The name Tulare is derived from the reed, tule, a large variety of bulrush with which the extensive marshes of that region were once covered.

[2] Reprinted from Public Health Reports by permission of the Surgeon General, U. S. P. H. S.

[3] Wherry, W. B., and Lamb, B. H.: Infection of Man with Bacterium Tularense, J. Infect. Dis., 15: 331–340, 1914. Vail, D. T.: Bacillus Tularense Infection of the Eye, Ophth., Rec., 23: 487, 1914. Sattler, Robert: Bacillus Tularense Conjunctivitis, Arch. Ophth., 44:265, 1915. Wherry, W. B.: A New Bacterial Disease of Rodents Transmissible to Man, Pub. Health Rep., 29: 3387–3390, 1914. Lamb, Frederick W.: Conjunctivitis Tularensis, with Report of a Case, Ophth. Rec., vol. 26, pp. 221–226, 1917.

guinea-pigs inoculated with material taken from the eye. These patients all applied to ophthalmic surgeons for their first treatment, and all were hospitalized on account of the severity of the local and constitutional symptoms. In each instance the conjunctiva of the left eye was the seat of ulcers which were accompanied by enlarged, painful glands in the preauricular and cervical regions of the left side, while the right eye and right glands remained normal. All patients had severe constitutional disturbance, accompanied by pain, fever, marked prostration, sweats, and chills, ending in slow recovery after an illness of from five to eight weeks' duration.

Case I was a male meat cutter in a cheap restaurant who applied for treatment in November, 1913; case II was a farmer's wife, living in southern Indiana, who had prepared rabbit meat for the table and applied for treatment in October, 1914; case III was a young colored girl who, two days before the onset of illness in November, 1916, prepared some rabbits for dinner. How the ocular infections occurred is unknown, but that the cottontail rabbits of southern Indiana were infected with *Bacterium tularense* was proved by Wherry, who isolated this organism by guinea-pig inoculation from two rabbits found dead 4 miles from the home of case II.

2. *Washington, D. C.*[4]—Case E. N., patient of Dr. J. Lawn Thompson, Washington, D. C., is the case discussed above.

3. *Charlotte, N. C.*[4]—Case Mrs. W., patient of Dr. Lucius G. Gage, Charlotte, N. C. This patient, while cleaning some quail on December 27, 1921, stuck the sharp point of a wing bone into the middle finger of her left hand, after which she turned to a pan full of rabbits and manipulated them. An attack of fever followed, which lasted about a month, and was accompanied by suppuration of the glands at the elbow, axillary adenitis, and marked scarring at the site of infection on the finger. On April 14, 1922, the patient still had some glandular enlargement and her blood serum was taken for examination at the Hygienic Laboratory of the Public Health Service. The test showed an agglutination of *Bacterium tularense* in dilution of 1 : 100.

MARKET INFECTIONS IN RABBITS

The examination of market rabbits for evidence of tularæmia should be undertaken in the months of November, December, and January, months embracing the "open season," at which time wild rabbits are unprotected by the game laws and consequently are offered for sale in large numbers. The rabbits found in the Washington market are popularly known as "cottontails," and are common to the states

[4] Hygienic Laboratory Bulletin No. 130, U. S. Public Health Service, Washington, D. C., pp. 80–81 .

east of the Mississippi River. They arrive at the market by express, packed in barrels, and have been dressed before shipment, so that the spleen, being attached to the stomach, has been removed with that organ, and probably not over 10 per cent of the animals still contain the liver. The shipments which we examined came from Kansas, Missouri, Kentucky, and Tennessee; whether with these there were some shipments from Maryland and Virginia is uncertain. Shippers and jobbers speculate in rabbits and resort to cold storage with the fluctuations in supply and price; consequently rabbits may have been killed a month previous to retail sale, by which time the infection may have died.

In our investigations, examination was confined to the liver, because this organ was the one most readily obtainable of the three (spleen, liver, and lymph glands) in which the lesions are readily seen by gross examination. We did not appear at the market, but relied on an immune salesman (E. N.) to pass his hand into the dressed rabbits and pull the livers from those in which it still remained. He brought to the laboratory 914 livers.

The first lot comprised 50 livers, two of which were studded over with small white foci of necrosis; a piece of each suspected liver was rubbed in a mortar, suspended in saline solution, strained through coarse gauze, and injected subcutaneously on the abdomen of a guinea-pig. Both guinea-pigs died on the fifth day, presenting a gray, granular caseation of the enlarged lymph glands of the groin and great numbers of small foci of necrosis studded over the enlarged spleen especially, and over the liver. Material from the lymph glands and spleen of the dead guinea-pig was rubbed on the shaved, abraded skin of the abdomen of another guinea-pig, causing its death in about a week with the same typical lesions of the lymph glands, spleen, and liver; and thus the infection has been propagated for five months and presumably could be carried on for years. Cultures of *Bacterium tularense* were obtained from the first guinea-pigs in the series, from the heart blood, spleen, and liver, by inoculation of these tissues on coagulated yolk of hen's egg and on serum glucose cystine agar, on which mediums the organism grows in two to five days. Material from eight livers of the first lot, presenting questionable lesions, was injected severally into eight guinea-pigs, with negative results.

The second lot was made up of 85 livers. Material from two, which looked especially typical, was injected separately into guinea-pigs, from both of which *Bacterium tularense* was recovered in cultures. Pooled material from eight livers was injected into guinea-pigs with the same positive results.

Unfortunately, no record was obtained of the original point of shipment of the rabbits which furnished the first and second lots of livers; consequently the first five infected livers were entirely without data as to the place from which they came. Subsequent lots were examined which came from Mohawk, Mosheim, Shouns, and Greeneville, Tenn.; Drexel, Mo.; Louisville, Ky.; and Paola, Kans. Out of these later lots two livers were found infected, one of which came from Greeneville, Tenn., and the other from Shouns, Tenn.

Cultural studies, conducted on the seven strains of *Bacterium tularense* isolated from rabbits sold in the Washington market, are reported in the article "The amino-acid cystine in the cultivation of *Bacterium tularense*." In that paper a table is presented in which the first 39 animals listed were infected with strains 1 to 7 obtained from the Washington market.

The finding of tularæmia in a Washington market man and in seven rabbits offered for sale at his counter, two of which came from Tennessee, has extended the known geographic distribution of this disease. To this must be added a focus at Charlotte, N. C., where one human case has occurred. The infection has now been found from the Atlantic to the Pacific coast, and additional cases of infection are to be expected.

The disease, so far as is now known, is confined to the United States, foci of infection having been found in California, Utah, Wyoming, Idaho, Colorado, southern Indiana, and Ohio, Tennessee, North Carolina, and Washington, D. C.

The investigation has shown that the distribution of tularæmia in the rabbits east of the Mississippi can be studied in the markets. Doubtless the markets of New York City receive shipments in December and January from every State east of the Mississippi, and afford material for making a survey of that vast territory.

DIAGNOSIS OF TULARAEMIA

Errors in diagnosis arise in cases which simulate typhoid fever, septic infection, and glanders.

In an endemic focus in Utah and the adjoining States, a person presenting a fly bite in June, July, or August, with inflammation of the adjacent lymphatic glands, and with fever and prostration, arouses at once the suspicion of tularæmia.

In the case of a person who has dressed and prepared rabbits for the table, as in the case of a market man or house servant, and who develops inflamed glands of the cervical, epitrochlear, or axillary regions, accompanied by fever and marked illness, tularæmia should be borne in mind and the appropriate tests should be made. These cases usually

develop in the months of November, December, and January, when rabbits become a common article of food offered in the markets.

Laboratory workers engaged in dissecting guinea-pigs, rabbits, and mice artificially infected with *Bacterium tularense*, and who present a sudden onset of fever, with or without glandular enlargements, and with or without an evident site of infection, should immediately consider tularæmia.

LABORATORY TESTS

1. *Animal inoculation.*—Pus obtained from the site of the fly bite, from some other site of infection, from the patient's suppurating glands, or from a wild rabbit's spotted spleen or liver, should be injected subcutaneously on the abdomen of guinea-pigs or rabbits. Such material should first be rubbed in a mortar, suspended in saline solution, and strained through coarse gauze. Within a week the animals should die, presenting a gray, granular caseation of the enlarged lymph glands of the groin, and great numbers of small foci of necrosis studded over the enlarged spleen especially, and over the liver.

Material from the dead animal's glands, spleen, and liver, when rubbed on the shaved, abraded skin of another guinea-pig or rabbit should likewise cause its death within a week, with the same typical lesions of the lymph glands, spleen, and liver. Thus the infection may be propagated for an indefinite number of passages through guinea-pigs or rabbits. Cultures of *Bacterium tularense* may be obtained by inoculation from the blood, spleen, or liver of these animals to coagulated egg yolk or serum glucose cystine agar, on which mediums the organism grows as a small, nonmotile, gram-negative rod. No growth will take place on plain agar. The bacteriologic diagnosis of tularæmia should not be expected from cultural inoculations, nor from smears made direct from the patient. In severe cases, the patient's blood, injected intraperitoneally into these animals, will likewise cause the infection and death of the animals.

2. *Agglutination.*—The blood serum of a patient suffering from tularæmia agglutinates *Bacterium tularense*, just as the serum of a typhoid patient agglutinates *Bacillus typhosus*. This is a very reliable and practical test. In our series of cases, the shortest interval after the onset of illness before the serum was tested was 13 days; the longest interval from the date of illness was two years. The reaction was positive in both instances, as well as for all intermediate periods.

3. *Complement fixation.*—The patient's blood serum fixes complement in the presence of an antigen made from *Bacterium tularense*. The agglutination test should, however, be given preference.

The Amino-Acid Cystine in the Cultivation of Bacterium Tularense

Cystine and its derivative, cysteine hydrochloride, are the only chemicals which, in these studies, after being added to fresh beef infusion peptone agar, have been found capable of rendering that medium favorable for the prolonged cultivation of *Bacterium tularense.* This organism will not grow on plain beef infusion peptone agar without the cystine; hence that medium is used as a routine negative control medium when cultivating the organism on mediums which are favorable to its growth.

Having found cystine favorable, a test was made of other amino-acids. Tryptophane, tyrosine, histidine dichloride, phenylalanine (racemic), leucine, lysin dihydrochloride, and glutamic acid hydrochloride were added to plain beef infusion peptone agar in the same proportion (0.1 per cent) in which cystine had been found favorable. No growth took place when these mediums were inoculated with *Bacterium tularense.*

The peculiar sulphur complex of cystine led to a trial of other chemicals containing sulphur. Sodium sulphite (anhydrous), sodium bisulphite, sodium thiosulphate (crystals), ammonium sulphate, magnesium sulphate, potassium sulphate, sublimed sulphur, and precipitated sulphur were added to plain beef infusion peptone agar in the proportion of 0.02 per cent, which proportion of cystine had also been found favorable. These mediums inoculated with *Bacterium tularense* gave no growth.

Aminoids-peptone was substituted for the peptone with which the beef infusion peptone agar is, as a routine, made up in the laboratory. Aminoids-peptone milk, aminoids-peptone beef, aminoids-peptone casein, and aminoids biuret-free were added to fresh beef infusion agar in the proportion of 1 per cent. No growth resulted when these mediums were inoculated with *Bacterium tularense.*

Casein 0.1 per cent, glucose 1 per cent, or haemoglobin (laked-horse cells), when added to fresh beef infusion peptone agar, failed to cause growth, whereas the addition of horse serum, 5 per cent, gave an occasional colony, thus indicating that horse serum is a favorable constituent.

The cultural tests enumerated above were made with human strains which had been carried for a year on artificial mediums, and with ground squirrel and rabbit strains which had been isolated four months previously.

Mediums containing hen's egg yolk, rabbit blood, or fresh spleen tissue of the rabbit or guinea-pig, are favorable mediums for the cultivation of this organism. In the light of our present knowledge of the

great selectiveness manifested by *Bacterium tularense* for cystine and cysteine hydrochloride, the question arises as to whether there is found cystine or its derivatives in all mediums which are favorable to the growth of the organism.

TABLE I.—*Substances tested for cultivation of Bacterium tularense by adding them to beef infusion peptone agar of pH 7.3*

	Amount added	Final pH	Result
	Per cent		
Cystine [Pfanstiehl]	0.1	7.3	Growth
Cysteine hydrochloride [Pfanstiehl]	0.1	6.8	Do.
Tryptophan [Pfanstiehl]	0.1	7.2	No growth
Tyrosine [Pfanstiehl]	0.1	7.1	Do.
Histidine dichloride [Pfanstiehl]	0.1	6.8	Do.
Phenylalanine (racemic) [Pfanstiehl]	0.1	7.1	Do.
Leucine [Pfanstiehl]	0.1	7.2	Do.
Lysin dihydrochloride (MXS) from picrate	0.1	7.0	Do.
Glutamic acid hydrochloride (Eastman Kodak Co.)	0.1	[2]6.9	Do.
Casein (free from fat-soluble A vitamine, free from water-soluble B vitamine). Harris.	0.1	7.1	Do.
Glucose	1.0	.....	Do.
Horse serum	5.0	.....	Occasional colony
Haemoglobin (laked horse cells)	.....	.....	No growth.
Sodium sulphite (anhydrous)	0.02	.....	Do.
Sodium bisulphite	0.02	.....	Do.
Sodium thiosulphate (crystals)	0.02	.....	Do.
Ammonium sulphate	0.02	.....	Do.
Magnesium sulphate	0.02	.....	Do.
Potassium sulphate	0.02	.....	Do.
Sublimed sulphur	0.02	.....	Do.
Precipitated sulphur	0.02	.....	Do.
Aminoids peptone milk (Arlington Chem. Co.)[1]	1.0	.....	Do.
Aminoids peptone beef (Arlington Chem. Co.)[1]	1.0	.....	Do.
Aminoids peptone casein (Arlington Chem. Co.)[1]	1.0	.....	Do.
Aminoids biuret free (Arlington Chem. Co.)[1]	1.0	.....	Do.

[1] Substituted for peptone in the medium. [2] Corrected.

ORIGINAL ISOLATIONS OF BACTERIUM TULARENSE ON CYSTINE MEDIUMS

In a previous paper[5] I reported the cultivation on cystine agar of strains of *Bacterium tularense* which had been originally isolated 12 months previously, and had been carried during the year on blood agar plus a piece of fresh sterile rabbit spleen.

While cystine agar was proved to be favorable for carrying strains which had become adapted to artificial mediums in twelve months of subcultivation, the suitability of cystine medium for original isolations was unproved. The experiments herein reported leave no doubt that mediums containing cystine or cysteine hydrochloride are entirely satisfactory for original isolations of *Bacterium tularense* from guinea-pigs and white mice.

The present paper reports original isolations from 55 animals, on

[5] Cultivation of *Bacterium tularense* on three additional mediums new to this organism. By Edward Francis, Surgeon, United States Public Health Service, Public Health Reports, vol. 37, April 28, 1922, pp. 987–989. Reprinted in Hygienic Laboratory Bulletin No. 130, pp. 83–84.

cystine mediums, of two strains of *Bacterium tularense* which had never been isolated but had been carried over in guinea-pigs by rubbing the spleen of an infected guinea-pig on the shaved, abraded skin of a healthy guinea-pig.

One of the strains used for this cultural work was of ground squirrel origin and was obtained from California, in 1920, by the inoculation of infected squirrel tissue into guinea-pigs; the other was of rabbit origin and was obtained from the Washington market in January, 1923, by inoculating rabbit liver into guinea-pigs.

COMPOSITION OF CYSTINE MEDIUMS

1. *Serum glucose cystine agar.*—Fresh beef infusion agar, containing 1 per cent peptone, 1 per cent agar, and 0.5 per cent sodium chloride, adjusted to a reaction having a pH of 7.3, is kept on hand in stock. When needed, there is added to the stock agar 0.1 per cent of cystine and 1 per cent glucose, and this is heated in the water bath sufficiently long to melt the agar and to sterilize the cystine and glucose, after which it is cooled to 50° C., when 5 per cent horse serum is added. The medium is then tubed, slanted, and incubated 24 hours to insure sterility.

2. *Serum glucose cysteine hydrochloride agar.*—This is the same as (1) except that cysteine hydrochloride is substituted for cystine.

3. *Glucose cysteine hydrochloride agar.*—This is the same as (2) except that no serum is added.

In medium (1) the pH of 7.3 is unchanged by the addition of cystine, while in mediums (2) and (3) the pH of 7.3 is changed to 6.8 by the addition of cysteine hydrochloride. *Bacterium tularense* grows equally well throughout the range from 7.3 to 6.8.

DISCUSSION OF TABLE II

The heart blood, spleen, or liver of 47 guinea-pigs and 8 white mice was cultured, either soon after death of animal or after it had been killed in the dying hours, upon slants of the following mediums:

1. *Coagulated egg yolk.*—The heart blood of 13 guinea-pigs was planted, of which 12 yielded a culture, while 1 remained negative. In 6 of the tubes, colonies appeared on the solid surface in the path of the drop of blood by the end of 48 hours. No colonies appeared on the other 6 tubes, but they showed organisms in abundance in stained preparations made from the water of condensation, which, when transferred to the slanted surface of another tube of the same medium, gave rise to great numbers of colonies. All cultures were subcultured once on the same medium, but further subcultures were not made, since the efficiency of coagulated egg yolk for the cultivation of *Bacterium tularense* had already been amply demonstrated.

2. *Serum glucose cystine agar.*—The heart blood (21), liver (8), or spleen (9) of 31 guinea-pigs, and the heart blood of 1 white mouse were planted, all but one of which gave a growth. Colonies appeared at various places on the solid medium, or close about the blood clot or piece of infected tissue. The shortest length of time which elapsed before the appearance of colonies was 2 days, the longest was 20 days, and the average was 4.6 days.

3. *Serum glucose cysteine hydrochloride agar.*—The heart blood (35), liver (5), or spleen (9) of 40 guinea pigs, and the heart blood of 7 white mice were planted, all but 2 of which gave a growth. The shortest length of time which elapsed before the appearance of colonies was 2 days, the longest was 16 days, and the average was 4.5 days.

4. *Glucose cysteine hydrochloride agar.*—The heart blood (30), liver (6), or spleen (6) of 30 guinea-pigs, and the heart blood of 5 white mice were planted, of which 34 grew and 13 failed to grow. The shortest length of time which elapsed before the appearance of colonies was 2 days, the longest was 17 days, and the average was 5.7 days.

5. *Plain agar.*—The heart blood (37), liver (12), or spleen (14) of 40 guinea-pigs, and the heart blood of 3 white mice were planted, only 8 of which showed growth. On 5 of the 8 tubes a single colony appeared on the ninth, tenth, twelfth, eighteenth, and twenty-fifth days, respectively; the sixth tube showed 3 colonies on the sixth day; the seventh tube showed 6 colonies on the sixth day, and the eighth tube showed 7 colonies on the ninth day. Transfers from these colonies to plain agar failed to grow, but transfers from the same colonies to serum glucose cystine agar grew, in all instances, and subcultures on this medium at seven-day intervals have all grown luxuriantly for four weeks. *Bacterium tularense* will not grow on plain agar. The explanation of the growth of this organism in the eight instances cited is found in the fact that the medium was no longer plain agar after the large drop of infected blood with which the tube was inoculated had been added to its surface; it became, in effect, blood agar, which will grow the organism.

METHOD OF INOCULATING CULTURE TUBES

The culture tubes recorded in the table were inoculated as follows:

1. *Heart blood.*—From an animal just dead or about to die, the heart blood was drawn into a coarse capillary pipette, from which a large drop was delivered to the top of the slanted surface of the medium and allowed to flow slowly down the center of the slant, just to, or into, the water of condensation, after which the tube was left for half an hour, inclined almost to the horizontal, in order to retain as much blood as possible in the path traversed by the drop.

2. *Spleen or liver.*—A piece of the spleen or liver about 3 mm. in diameter was taken from the infected animals after searing the surface of the organ. A piece of heavy wire, battered into the shape of a sharp-edged scoop, served for taking this tissue, which was transferred to and rubbed over the surface of the medium as forcibly as the consistency of the latter would permit, and then left to remain on the solid medium just above the water of condensation, into which the scoop was finally dipped.

APPEARANCE OF THE GROWTH

There is a marked difference between the appearance of the growth following inoculation of a culture medium with the heart blood of a mouse and that which results from inoculation with the blood, liver, or spleen of a guinea-pig or rabbit.

1. *Mouse.*—Mouse blood gives rise to a diffuse, dense growth throughout the path traversed by the blood, due probably to the greater number of organisms in the blood of this animal. I have never seen colony formation after inoculation with mouse blood; the growth is diffuse.

2. *Guinea-pig and rabbit.*—The heart blood of the guinea-pig or rabbit gives rise to colonies in the path of the drop, and especially about the clot at the bottom of the blood path, in case the blood has stopped flowing at a point above the water of condensation. If the blood has flowed into the water of condensation, growth appears as a transverse band on the solid medium at its juncture with the water of condensation; or, instead of the transverse band, growth may be delayed until the water of condensation has evaporated, at which time growth takes place around the uncovered clot at the bottom of the tube on the moist solid medium.

When the medium has been inoculated with infected spleen or liver, instead of heart blood, colonies appear where the medium has been rubbed with the piece of infected spleen or liver, and especially around the point where the piece of infected tissue has been allowed to remain. Great numbers of colonies were rarely seen; often there was only a single colony; generally 5 to 10 colonies appeared. The colonies reach a diameter of about 1 or 2 mm. and do not coalesce or extend over the surface of the medium. If, however, a colony is spread over the medium with a sterile platinum loop, a diffuse growth quickly follows.

CHOICE OF MEDIUM

A study of the percentage of "growth" and "no growth" summarized at the end of Table II shows:

1. For serum glucose cystine agar, an efficiency of 97.4 per cent, 39 tubes having been inoculated from animals, all of which grew except 1.

2. For serum glucose cysteine hydrochloride agar, an efficiency of

TABLE II.—*Comparative value of several mediums for original isolation of Bacterium tularense from the spleens, livers, and heart blood of 55 infected animals.*

No. of animal.	Designation of animal.	Tissue planted.	Date planted.	Mediums on which tissues of infected animals were planted.				
				Coagulated egg yolk slant.	Serum glucose cystine agar slant.	Serum glucose cysteine hydrochloride agar slant.	Glucose cysteine hydrochloride agar slant.	Plain agar slant.
				(*a*) RABBIT STRAIN OF TULARÆMIA OBTAINED FROM THE WASHINGTON (D. C.) MARKET				
	Guinea-pigs.		1923.					
1	Market 7–1.	Heart blood.	Mar. 10	.....	Growth fourth day...	Growth fifth day....	.....	
2	2.	.....do.....	Mar. 11	.....	Growth fifth day....	.....	.....	
3	–3.	.....do.....	Mar. 17	Growth second day....	Contaminated.....	Growth third day....	Growth third day..	Contaminated.
4	–4.	.....do.....	Mar. 16	Growth from water of condensation.	Growth late.....	Growth late.....	No growth.....	No growth.
5	–5.	.....do.....	Mar. 12	.....	.....	Growth third day....	.....	1 colony eighteenth day.
6	–6.	.....do.....	Mar. 13	.....	Growth sixth day....	Growth seventh day..	Growth sixth day..	1 colony twelfth day.
7	–7.	.....do.....	Mar. 14	Growth from water of condensation.	Growth fifth day....	Growth fifth day....	Growth fifth day...	1 colony ninth day.
8	–8.	.....do.....	...do...	Contaminated.....	Growth third day....	Growth third day....	Growth third day..	Contaminated.
9	–9.	.....do.....	...do...	Growth second day....	Growth fifth day.....	Growth fourth day...	Growth fourth day.	No growth.
10	–10.	.....do.....	Mar. 16	.....do.....	Growth third day....	Growth third day....	Growth third day..	Do.
11	–11.	.....do.....	Mar. 14	Growth from water of condensation	Growth ninth day....	Growth eleventh day.	No growth.....	Do.
12	–14.	.....do.....	Mar. 16	Contaminated.....	Contaminated.....	Contaminated.....	Growth third day..	Contaminated.
13	–16.	.....do.....	...do...	No growth.....	.....do.....	Growth fourth day...	Growth fourth day.	Do.
14	–17.	.....do.....	...dc...	Growth from water of condensation.	Growth fifteenth day.	.....do.....	Growth late.....	No growth.
15	–19.	.....do.....	Mar. 19	Growth second day....	Growth fifth day.....	Growth fifth day.....	Growth third day..	3 colonies sixth day.
16	–20.	.....do.....	...do...	.....do.....	Growth fourth day...	Growth fourth day....	Growth fourth day.	No growth.
17	–21.	.....do.....	...do...	Growth from water of Condensation.	Growth second day...	Growth fifth day.....	.....do.....	6 colonies sixth day.
18	–22.	.....do.....	Mar. 20	.....do.....	Growth fifth day.....	Contaminated.....	Growth fifth day...	1 colony tenth day.
19	–23.	.....do.....	Mar. 21	Growth second day....	Contaminated.....	Growth fifth day....	Growth fourth day.	7 colonies ninth day.
	Mice.							
20	Market 1...	.....do.....	Jan. 14	.....	.....	Growth third day....	.....	Contaminated.
21	2...	.....do.....	Jan. 15	.....	.....	.....do.....	Growth fifth day...	No growth.
22	2...	.....do.....	...do...	.....	.....	.....do.....	.....	1 colony twenty-fifth day.
23	3...	.....do.....	Jan. 17	.....	.....	.....do.....	.....	Contaminated.

24		3...	.....do.....	..do....	.....	.....	Growth sixth day....	Growth sixth day..	No growth.
25		Dilution 2...	.....do.....	Jan. 20	.....	Growth second day...	.....	Growth second day.	
26		3...	.....do.....	Jan. 21	.....	.....	Growth second day...	Growth fourth day.	
27		6...	.....do.....	Jan. 24	.....	.....	Growth.....	Growth.....	
	Guinea-pigs								
28	Market	2...	.....do.....	Jan. 8	.....	.....	Growth fifteenth day.	Growth ninth day..	No growth.
28		2...	Liver.....	...do...	.....	.....	No growth.....	Growth seventeenth day.	Do.
28		2...	Spleen.....	...do...	.....	Growth fifth day.....	Growth fifth day....	.....	Do.
29	Market	6...	.....do.....	Jan. 17	.....	Growth third day....	Contaminated.....	Contaminated.....	Contaminated.
30		6...	Heart blood.	Jan. 22	.....	.....do.....	.....	Growth third day..	No growth.
31		1...	.....do.....	Jan. 1	.....	.....	Growth sixth day....	No growth.....	Do.
32		5...	.....do.....	Jan. 3	.....	.....	Growth seventh day..	Growth eleventh day.	Do.
32		5...	Spleen.....	...do...	.....	.....	.....do.....	No growth.....	Contaminated.
33		4...	Heart blood.	...do...	.....	.....	Growth eleventh day.	Growth eighth day.	Do.
33		4...	Spleen.....	...do...	.....	.....	Growth eighth day...	No growth.....	No growth.
34		4...	Heart blood.	Jan. 7	.....	.....	Growth fifth day.....	Contaminated.....	Do.
34		4...	Liver.....	...do...	.....	.....	Growth sixth day....	.....do.....	Contaminated.
35		4...	Heart blood.	Jan. 14	.....	.....	Growth sixteenth day.	Growth.....	No growth.
36		4...	.....do.....	Jan. 18	.....	No growth.....	.....	Growth twelfth day	Do.
37		3...	.....do.....	Jan. 1	.....	.....	Growth sixteenth day.	.....	Do.
37		3...	Spleen.....	...do...	.....	Growth fourth day..	.....	.....	Do.
38		3...	Heart blood.	Jan. 8	.....	.....	Growth fifteenth day.	No growth.....	Do.
38		3...	Spleen.....	...do...	.....	Contaminated.....	Growth third day....	.....	Contaminated.
39		3...	Heart blood.	Jan. 13	.....	Growth twentieth day	.....	No growth.....	No growth.
39		3...	Liver.....	...do...	.....	Growth seventh day..	.....	.....do.....	Do.
39		3...	Spleen.....	...do...	.....	.....	Growth fourth day...	Growth fourth day.	Do.

(*b*) GROUND SQUIRREL STRAIN OF TULARÆMIA OBTAINED FROM CALIFORNIA

	Guinea pigs.								
40	San Francisco	1.....	Heart blood.	1922 Dec. 11	.....	.....	Growth ninth day....	.....	No growth.
41		8.....	.....do.....	Dec. 16	.....	.....	Growth fourth day...	.....	Do.
41		8.....	Liver.....	...do...	.....	.....	Growth seventh day..	.....	Do.
41		8.....	Spleen.....	...do...	.....	Growth fourth day...	.....	.....	Do.
42		9.....	Heart blood.	Dec. 17	.....	.....	Growth third day....	.....	Do.
42		9.....	Spleen.....	...do...	.....	Growth sixth day....	.....	.....	Do.
43		10.....	Heart blood.	...do...	.....	Growth third day....	.....	.....	Do.
43		10.....	Liver.....	...do...	.....	.....do.....	.....	.....	Do.
43		10.....	Spleen.....	...do...	.....	Growth fifth day.....	.....	.....	Do.
44		12.....	Heart blood.	Dec. 19	.....	.....	Growth third day....	.....	Do.
		12.....	Liver.....	...do...	.....	Growth sixth day....	.....	.....	Do.
34		12.....	Spleen.....	...do...	.....	Growth fourth day...	.....	.....	Do.
45		13.....	Heart blood.	Dec. 21	.....	Growth third day....	.....	Growth seventh day	Do.
45		13.....	Liver.....	...do...	.....	Growth second day...	.....	No growth.....	Do.
45		13.....	Spleen.....	...do...	.....	.....	No growth.....	.....do.....	Do.

TABLE II.—*Comparative value of several mediums for original isolation of Bacterium tularense from the spleens, livers, and heart blood of 55 infected animals*—Continued.

No. of animal.	Designation of animal.	Tissue planted.	Date planted.	Mediums on which tissues of infected animals were planted.				
				Coagulated egg yolk slant.	Serum glucose cystine agar slant.	Serum glucose cysteine hydrochloride agar slant.	Glucose cysteine hydrochloride agar slant.	Plain agar slant.
(*b*) GROUND SQUIRREL STRAIN OF TULARÆMIA OBTAINED FROM CALIFORNIA—Continued.								
	Guinea-pigs—Con.		1922.					
46	San Francisco 14.....	Heart blood.	Dec. 21	.....	.....	Growth fourth day...	Growth fifth day..	No growth.
46	14.....	Liver.....	...do...	.....	.....	Growth fifth day....	.....do.....	Do.
46	14.....	Spleen.....	...do...	.....	Growth second day...	.....	.....do.....	Do.
47	15.....	Heart blood.	...do...	.....	.....	Growth fourth day...	No growth.....	Do.
47	15.....	Liver.....	...do...	.....	Growth fifth day....	.....	.....do.....	Do.
47	15.....	Spleen.....	...do...	.....	Growth second day..	.....	Growth third day..	Do.
48	16.....	Heart blood.	Dec. 22	.....	Growth third day....	Growth third day....	.....	Do.
48	16.....	Liver.....	...do...	.....	.do.....	.....	.....	Do.
48	16.....	Spleen.....	...do...	.....	.....	Growth sixth day....	.....	Do.
49	17.....	Heart blood.	...do...	.....	Growth third day....	.....	Growth thirteenth day.	Do.
49	17.....	Liver.....	...do...	.....	.....	Growth sixth day....	.....	Do.
50	18.....	.....do.....	...do...	.....	Growth fourth day...	.....	.....	Do.
50	18.....	Spleen.....	...do...	.....	.....	Growth fourth day...	.....	Do.
51	19.....	.....do.....	Dec. 23	.....	.....	Growth fifth day....	.....	Do.
52	20.....	Heart blood.	Dec. 25	.....	.....	Growth seventh day.	.....	Do.
53	25.....	.....do.....	Dec. 28	.....	.....	.....do.....	.....	Do.
			1923.					
54	26.....	.....do.....	Jan. 1	.....	.....	Growth sixth day....	.....	Do.
54	26.....	Liver.....	...do...	.....	Growth third day...	.....	Growth sixth day..	Do.
55	24.....	Heart blood.	Jan. 15	.....	.....	Growth tenth day....	No growth.....	Do.
Total number of "growths" on each medium.				12	38	54	34	8
Total number of "no growths" on each medium.....				1	1	2	13	58
Percentage of "growths" on each medium..				92.3	97.4	96.4	72.3	12.1

96.4 per cent, 56 tubes having been inoculated from animals, all of which grew except 2.

3. For glucose cysteine hydrochloride agar, an efficiency of 72.3 per cent, 47 tubes having been inoculated from animals, all of which grew except 13.

The total number of isolations obtained on these three mediums was 126, each of which was subcultured on its own kind of medium every seven days for 14 weeks; all grew well in all subcultures except 4, which were lost in the first transfers. Notwithstanding the failure of glucose cysteine hydrochloride agar in 13 out of 47 attempts at original isolations, the growth on this same medium of subcultures of the 34 successful isolations has always been abundant.

Cystine is not very soluble in the beef infusion peptone agar, and for that reason it should be pulverized before being added; even then visible particles settle in the medium. Its addition causes no change in the pH. Cysteine hydrochloride is very soluble, but causes an acidity of the medium and, if added in the proportion of 0.1 per cent, changes the initial pH of the beef infusion peptone agar from 7.3 to 6.8. The organism grows equally well within that range.

The mediums containing cystine or cysteine hydrochloride are as clear, transparent, and firm as plain agar; therefore the slightest growth is readily seen and large amounts of growth are readily removable for antigens, free from particles composing the medium, which, of course, is not true of coagulated egg yolk, or mediums supplied with blood, or fresh sterile spleen tissue. In the preparation of these mediums all constituents, up to the point of adding the sterile horse serum, are sterilized by heat; but it is exceedingly rare to get contamination from the horse serum.

The part played by glucose in the medium is important. In spite of the fact that glucose added to plain beef infusion peptone agar will not grow the organism, glucose added to cystine agar produces a much larger growth than cystine agar without the glucose.

The three mediums proposed in this paper have been extensively and successfully used for a year in making original isolations of *Bacterium tularense*, in subcultivation of this organism, in growing antigens for agglutination tests, for complement fixation, and for immunization of animals. For these purposes serum glucose cystine agar, serum glucose cysteine hydrochloride agar, and glucose cysteine hydrochloride agar are shown to be equally good, with the exception that the third fell considerably below the first and second in efficiency for original isolations. The third contains no serum. In subcultures the growth is luxuriant in 24 hours on all three mediums.

ASSOCIATION NOTES

COMING MEETING AT CARLISLE BARRACKS, PA. OCTOBER 4-6, 1923

In response to inquiries regarding the question of accommodations during the period of the coming meeting at Carlisle Barracks, the following information has been furnished by Col. P. M. Ashburn, M. C., the present Commandant of the Medical Field Service School. Effective with the first of August, 1923, Col. Charles R. Reynolds, M. C., U. S. A., will succeed Colonel Ashburn as Commandant of the school.

1. The accommodations for members of the Association at Medical Field Service School:

(*a*) Room, bed, bedding, towels, bedroom service and laundry, $0.50 per day.

(*b*) Mess and dining-room service, $1.50 per day; no rebate for meals missed.

Approximate cost of above to each member, $2.00 per day.

Bed rolls need not be brought, and either uniform or civilian clothes may be worn.

2. Following is a list of principal hotels at Carlisle and Harrisburg, and the prices quoted by each:

Hotel Carlisle:

Rooms without bath, single	$2.00
Rooms without bath, double	4.00
Rooms with bath, single	2.50
Rooms with bath, double	4.50 and up

Meals a la carte.

Hotel Argonne:

Rooms	$1.00
Rooms, with running water	1.50

Separate baths. Meals a la carte.

Hotel Wellington:

Rooms, single	$1.50 and $2.00
Rooms, double	2.50 and 3.00
Rooms with bath, single	2.50
Rooms with bath, double	3.50

Meals, American and a la carte.

Hotels—Harrisburg

Penn-Harris:

Rooms without bath	$2.50
Rooms with bath	$3.00, $3.50, $4.00

Meals a la carte.

Hotel Columbus:

Rooms without bath	$2.00 and $2.50
Rooms with bath	3.00 and 3.50

Meals a la carte.

Bolton Hotel:

European plan	$2.00 to $3.50
American plan	4.00 to 5.50

Senate Hotel:

Rooms without bath	$2.00
Rooms with bath	3.00

3. There are no housing accommodations available for the entertainment of lady members of the families of delegates at Carlisle Barracks. There is an officers' recreation room, however (Red Cross House), which can be used as a hostess house and placed at the disposal of visiting ladies during the period of the convention; simple lunches such as milk, coffee, sandwiches, small cakes, etc., can be served to them there by the Post Exchange.

4. It hardly seems feasible to attempt to publish a schedule of trains entering and leaving Harrisburg, as the number of them is so great and each man will have to look up his own, depending upon the part of the country from which he comes.

Following is a list of trains between Harrisburg and Carlisle:

Leave Harrisburg	*Arrive Carlisle*	*Leave Carlisle*	*Arrive Harrisburg*
4:45 A.M.	5:33 A.M.	2:37 A.M.	3:10 A.M.
7:05	7:58	5:20	6:05
8:15	8:54	7:00	7:45
9:48	10:30	8:40	9:12
11:59	12:37 P.M.	10:45	11:20
3:23 P.M.	4:03	12:46 P.M.	1:35 P.M.
3:40	4:16	2:06	2:40
5:20	6:05	4:40	5:25
5:45	6:28	5:45	6:15
6:30	7:15	6:17	6:57
7:45	8:20	8:36	9:15
11:10	11:45	12:06 A.M.	12:40 A.M.

It will be feasible to have Carlisle trains met by representatives of the post and to furnish transportation from the station in Carlisle to the post. It would not be feasible or necessary to attempt to run a bus line between the post and Harrisburg as the train schedules are good and in addition there is a trolley line between the two places, running cars hourly.

5. There will be a room available as the office and headquarters of the Association.

The tentative program, subject to possible change, is as follows:

Oct. 4: Preliminary Meeting, Reports, Demonstration of New Equipment for Medical Troops and Units.

Oct. 5: All Day Demonstration of Lines of Medical Aid from the Firing Line back to and including the Field Hospital.

Oct. 6: Final Meeting, Election of Officers, Presentation of Papers. Adjournment.

BOOK REVIEWS

THE STORY OF MANKIND: By Hendrik Van Loon, A.B., Ph.D., Author of the Fall of the Dutch Republic, The Rise of the Dutch Kingdom, The Golden Book of the Dutch Navigators, A Short Story of Discovery, Ancient Man. Illustrated. 8°, 489 pp. Boni and Liveright, New York, 1921.

The history of history has received, strangely enough, much less attention at the hands both of the writers and the readers of history than that of almost any other form of human activity—political, social, religious, scientific, military, or what not. Perhaps it may be that the historian, engrossed in the exposition of a single period, or campaign, or scientific achievement, to which he had set himself, has failed to realize that his own art has passed through a long period of evolutionary development embracing may centuries. Ignorance or disregard of such development may have depended upon the fact that only within recent times has the history of man's activities been written otherwise than in disjointed and disconnected fashion. We must perhaps believe that the more recent conception of human history as a uniform whole has been the necessary stimulus to men to delve into the history of this history-making.

The Greek *ἱστορία* denoted the inquiry after knowledge in its broadest sense, but it did not include in its concept the actual recording of events in narrative form. The word in its original meaning goes back at least five hundred or six hundred years before the advent of the present era. Some hundreds of years later history as a branch of scientific research and as a record of human activity began. Perhaps it was in the mind of Herodotus that this new application of the term first came into being, though Aristotle seems to have been actually the first to apply it to a literary product based upon investigation of fact, rather than to the investigation itself. Through the Middle Ages the single Aristotelian conception of the meaning of the word continued to prevail, and the dual rôle of the historian as hinted at by Herodotus was discarded until very recent times. "History" (from the Latin *Historia*) has indicated to man's mind a subdivision of literature. Now, however, the world envisages history in its two-fold capacity—investigation, which is within the realm of science, and written presentation of the results of that investigation, a phase of art.

Most broadly viewed, history is bound to concern itself with all happenings,—not only those in which Man is directly or intimately concerned, but as well with all the phenomena—animate and inanimate—throughout the whole universe. In other words, history is a record of all change. The later generations have come to see that instability is a universal law, and that such instability affects not only chemical compounds, animal bodies, the positions of the planets with reference to each other and to the Universe in space but also the social fabric which Man has been slowly evolving from earliest times and whose laws he is continually engaged in codifying for the purpose of defining his own relations with his fellows. And it has resulted naturally from a growing recognition of this inevitable evolution of the social order, that the World no longer assumes to criticize the worthies of earlier epochs for not having conformed in all phases of their human exist-

ence to the standards which we of today have set up for our own guidance. To each age has been given its own culture and its own method of expressing that culture, and since history is one continuing element in successive cultural states, it follows perforce that history has seen changes in its own tasks, in its own point of view, in its own concept of duty, in the technical methods by which it seeks to present its product, and even in its results themselves. Had it been otherwise, history could not have fulfilled its great function by virtue of which it has "entered into every phase of activity."

To speak of those periods concerning which an actual narrative (written or otherwise) has not come down to our own day as "prehistoric" is to misuse adjectives. Preliterary they may have been, but not prehistoric, for the myth and saga of whose existence we know, but whose substance we have lost, constituted history as truly as do the countless printed tomes with which today the stacks of our libraries are filled. Imagination in that era was a factor of primary importance; but even imagination could not be entirely baseless from the point of view of form. Poetry, a poor medium for the recording of facts; inscriptions, so recently interpreted by the archaeologist; the earlier chronicles, those of the family and of the state; religious records, written and preserved by the priests,—these are the individually successive steps by which history progressed from the first exercise of the functions of memory and speech to the days of the Ionian *logographi*. Among these men there are to be traced the first beginnings of the true historical spirit as it is conceived of today,—that spirit which led its possessors to inquire diligently into and record accurately the phases of human affairs with which they dealt. Hecataeus of Miletus, to whom the traditions of the Greeks seemed "manifold and laughable"; Herodotus, an observer of critical capacity who weighed carefully the evidence both for and against the validity of the instances which he recounted; Thucydides, who "lifted historical narrative into the realm of pure literature"; Xenophon, the rhetorician; and Dionysius of Halicarnassus,—all these names and many others are to be found in that list of Greek observers and thinkers to whom must in justice be ascribed the honor of having first conceived of history in its noblest aspect.

Through succeeding civilizations it is possible to trace the history of history with its advances and recessions, its successes and failures, its truth and error, until the Renaissance and the Reformation—the latter probably much more than the former—brought into play again the elements of critical investigation which had been so largely neglected since the days of the Greek historians already mentioned. Germany saw at this time an awakening recognition of the fact that consultation of original sources was essential to accuracy in historical writing. One group of historical scientists, contemporary with the leading spirits of the Reformation and concerning whose labors but little is now known should not be omitted from mention. These were the Benedictine monks of the monastery of St. Germain-des-Prês. Of their school it is said that its place "in the history of history is absolutely without a parallel" and of the monks themselves that they laid "the basis for all scientific history."

The nineteenth century saw a mechanical feature introduced into the work of historical research. Groups of investigators began systematically the examination of all valuable collections of data and the extraction there-

from of material which was to be brought together into lucid and well oriented historical narratives. These individuals—cataloguers, bibliographers, indexers, and abstractors—have constructed a system of machinery that makes it easily possible in the present day for a writer to secure in an incomparatively short space of time a complete list of references concerning the subject to whose elucidation he has dedicated himself. Because of the vast amount of detailed material thus made available, modern history (the history written within the last century) has shown a tendency to specialize more than was done in earlier epochs. Thus, we have the works of Carlisle, of Gibbons, McCauley, Motley, and many other authors who have treated of particular and highly specialized phases of the political and social activities of European nations. Such histories have been accused of separating themselves by too great a distance from the human side of their subject and of overwhelming their readers with too detailed an array of facts. Whether or not such criticism is justified must be left to the determination of a larger wisdom. Certain it is, however, that the last few years have seen, at least in two instances, a more emphatic insistence upon the unity of all history and a more personal tone in the recounting thereof. Mr. H. G. Wells' "Outline of History" suggests in its style that it might originally have been told by an explorer just returned after extensive travels of research and investigation from an easy chair in his club to a group of listening acquaintances. And Professor Hendrik Van Loon has gone Mr. Wells "one better" in the volume whose title appears as the caption of this review in that he has told, not the history of mankind, but "The Story of Mankind," in language which is rarely more rhetorical that colloquial, and often is definitely "slangy" according to the type of the most modern American college student. Thus it is noted (at random) that "The Roman Empire was an accident. No one planned it. It 'happened.' No famous general or statesman or cutthroat ever got up and said 'Friends, Romans, Citizens, we must found an empire.'" We learn also that "when the Crusaders (most of whom had very little money) could not pay the price, these Italian 'profiteers' kindly allowed them to 'work their way across.'" And finally, "Indeed it has come to pass that many of the ills of this world, which our ancestors regarded as inevitable 'acts of God,' have been exposed as manifestations of our own ignorance and neglect. Every child nowadays knows that he can keep from getting typhoid fever by a little care in the choice of his drinking water. But it took years and years of hard work before the doctors could convince the people of this fact. Few of us now fear the dentist chair. A study of the microbes that live in our mouth has made it possible to keep our teeth from decay. Must perchance a tooth be pulled, then we take a sniff of gas, and go our way rejoicing. When the newspapers of the year 1846 brought the story of the 'painless operation' which had been performed in America with the help of ether, the good people of Europe shook their heads. To them it seemed against the will of God that man should escape the pain which was the share of all mortals, and it took a long time before the practice of taking ether and chloroform for operations became general."

The element of illustration is as unique as the style. It consists in approximately 140 black and white line illustrations, 8 three-color pages, numerous animated maps and half-tone pictures, and an animated chronology of the history of the world done by the author. The nature of the art which

characterizes these illustrations is difficult of description for one who is not himself an artist. Moses viewing the Holy Land is represented by the figure of a man wearing a long gown and a mask (it is difficult to understand how he can see through the mask), carrying a staff, and looking from the top of a precipice down into a valley wherein are scattered a few date palms on either side of a narrow stream. There are mountains and a cloud in the background. The Inquisition consists of a door of planks set in a thick stone wall. There is a small grating in the middle of the door. Imagination must be relied upon to produce the rest of the picture. Moscow is pictured by the Kremlin in yellow with a few inverted tobacco plants(?) in the foreground. One span of the Brooklyn Bridge and less than a dozen houses of essentially uniform architecture and height represent "The modern city." "The New World" consists of a Spanish galleon at anchor and in the distance a few black lines with four palm trees for the visible portion of America.

Professor Van Loon describes how he came to write "The Story of Mankind" in the following words:

"The origin of 'The Story of Mankind' is a very simple one. I suffered as a child from the exceedingly bad method of history-teaching which was used in my native land. When I crossed the ocean, I discovered that my own children in the schools of my adopted country were taught a sort of history which made them the sincere and devoted enemies of history for life.

"At the same time the political development of the world during the last six years, and the entrance of America upon the scene of international politics as the most important actor, destined to 'play the lead' for the next five hundred years, convinced me that a proper and reasonable understanding of historical cause and effect was the most important factor in the lives of the rising generation.

"And so my book does not divide history into several unconnected watertight compartments; it treats the entire history of the human race as a single unit, and shows us and our children that we are but links in an endless and fascinating chain of human development. It begins in the dim and hardly understood realm of the earliest past; it can be continued forever."

No more fascinating, enjoyable and instructive book on any subject has appeared for a long time. It offers to every reader a point of view from which he may get a glimpse of those of his own species who formerly populated the world—a glimpse that will present them to him as being equally human with himself. No higher tribute can be paid the volume than to quote the words of another reviewer: "Although written for children, it belongs to that noble department of literature *in which the words are for children and the meanings are for men.*"

A. N. Tasker.

Principles of Strategy, With Historical Illustrations, by Colonel William K. Naylor, General Staff, Director of the General Staff School, The General Service Schools. 8°, 367 pp., 16 l. The General Service Schools Press, Fort Leavenworth, Kansas, 1921.

This is definitely and distinctly a textbook on military strategy, but it is at the same time, as may be shown later—so it is hoped—more than that.

The textbook character of the work (which is, perhaps, the one that most forcibly impresses at the first reading) is indicated by certain features. The author is meticulously careful to give the best and most detailed definition of all terms concerning which there may be misunderstanding; and when there is choice between two or more definitions he critically compares them all. Thus:—"As previously stated, the word 'strategy' is derived from the Greek word *strategos*, meaning a general. Some writers, principally German, therefore define strategy as the art of generalship. This definition is unsatisfactory, for many of the most brilliant exhibitions of generalship have occurred on the field of battle and clearly in the domain of tactics. Recall Napoleon at Austerlitz, Wellington at Salamanca, or Marshal Foch at the first battle of the Marne. Strategy has been defined as the art of moving armies in the theater of operations; but this definition is open to the objection that troops actually engaged in battle are in the theater of operations, so that in this definition tactics is *swallowed* up by strategy. Another definition of strategy is that it is the art of moving troops not in the presence of the enemy. This answer is not satisfactory, for the culminating point of nearly all strategy is the field of battle where *you* are unquestionably in the presence of the enemy. Strategy has been defined also as the art of taking an enemy at a disadvantage. This is not satisfactory, for no one can say that the use of gas for the first time at Ypres did not take the British and French at a disadvantage; yet there was no strategy about it. Again, it has been defined as 'the art of assembling and moving armies and fleets for the purpose of furthering the interests of one's own government in a political strife with another.' One writer defines strategy as 'the art of assembling and moving armies and fleets to carry out the purposes of the war.' Hamley says that 'the theater of war is the province of strategy—the field of battle is the province of tactics.' A definition given by Helmuth von Moltke is that 'Strategy is the application of common sense to war.' This is an admirable definition, but should not be restricted in its use to strategy alone. The definition of Wagner is quite a good one, as it covers both strategy and tactics: 'Strategy is the art of moving an army in the theater of operations, with a view of placing it in such a position, relative to the enemy, as to increase the probability of victory, increase the consequence of victory and lessen the consequences of defeat.' Strategy may be called the art of directing armies; tactics, the science of troop leading. The difference between strategy and tactics has been discussed at length here for the reason that these terms appear in all textbooks and an exact knowledge facilitates a general survey of the art of war." Similarly individual concepts are subdivided and classified so far as may be possible. For example—"There are two general types of defensives, namely, the active, or the true defensive, and the passive. The true defensive contemplates a counter-stroke, sometimes called 'the decisive counter-attack, or the offensive-defensive.' "

The precision with which statements are made, comparisons instituted, and conclusions stated partakes of the characteristics of mathematics in exceptional measure. We find an impressive illustration of this in the following paragraphs:

ADVANTAGES OF THE NAPOLEONIC TYPE (of campaign)

In event of surprise, or the situation developing differently from that expected, the troops at least are concentrated and no great amount of harm can be done.

DISADVANTAGES OF THE NAPOLEONIC TYPE

1. Requires a considerable amount of territory for its execution.
2. If the enemy is in position near the frontier, it can only be done by drawing the troops together on the base line. This results in flank marches which, if executed too near the enemy, may result in flank attacks, surprises, and unpremeditated combats.
3. A change in the situation, however, may occur while the concentration is going on.

This is exactly what happened to Napoleon in 1806. He thought that the Prussians were retiring before him on the road from Leipsic to Berlin and found them in position back of the Saale.

The crowded advance, of course, causes great hardships. In 1813, Napoleon virtually wore his army out by his continual marching in mass formation. In 1859 and 1866, the Austrians suffered very much from the same cause. If the enemy is able to dodge the blow, as did Blucher twice in August and in the beginning of September, 1813, the united mass will soon be constrained to give up the game, or to separate in the presence of the enemy, either plan being dangerous.

ADVANTAGES OF THE VON MOLTKE TYPE

1. Allows the retention of separate columns up to the last moment.
2. In case the enemy falls back, the point of concentration can be pushed farther into his territory.
3. The separation of the columns facilitates the subsistence.

DISADVANTAGES OF THE VON MOLTKE TYPE

1. The enemy may appear suddenly in mass and defeat one or more of the columns.
2. Lack of skillful handling may cause the defeat of a single column and jeopardize the success of the whole movement.
3. The movement in parallel columns makes it possible to defeat the heads before their rears arrive and will force a concentration to the rear.

This is what occurred at the first battle of the Marne. The heads of the various German columns engaging the assembled British and French were thrown back and forced to assemble on the Aisne, which was to their rear.

The defeat of Sigel, in the Shenandoah, in the spring of 1864 and the bottling up of Butler at Bermuda Hundred, when the operations of these two forces were part and parcel of the general Federal movement, might have had a disastrous effect on the general plan, had not the Confederates virtually lost the war by that time.

4. When the columns are widely separated the influence of the commander-in-chief naturally becomes less and less, and he is dependent on the actions of his subordinates.

The defeat of Von Bonin's separate columns at Traustanazi when the Crown Prince's Army was marching to unite with Prince Frederick Charles, might have caused a disaster had the Austrians taken advantage of their success.

KIND OF GENERALS NECESSARY IN THE VON MOLTKE TYPE

"The great majority of the generals must be energetic, circumspect and quite in harmony with the ideas of the commander-in-chief."

KIND OF TROOPS NECESSARY IN THE VON MOLTKE TYPE

Troops must be seasoned and of the type that will not be demoralized by an unfavorable turn of affairs.

APPLICATION OF THE PRINCIPLES

The principles of Napoleon and Moltke have both led to great results. They both seek a similar purpose, which is to bring the united action of a superior force into battle.

Each principle is of equal value, each one is appropriate to certain preceding conditions, and neither of them can be arbitrarily applied.

CONCLUSION

The choice as to which of the two principles is to be our guide in selecting the concentration point for our armies must be made by the commander after consideration of all the good and bad points of each.

The main idea to keep uppermost is to concentrate the troops so as to be able to have them cooperate on the field of battle.

Excerpts illustrative of this "snappy" character of the textbook phase of the work could be multiplied many times; but there is no need. It will, however, be of advantage to indicate here the general subjects which are dealt with beginning at Chapter III, where the "textbook" first makes its appearance. These are:

Chapter III—Methods of Waging War.
Chapter IV—The Leading Principles of Strategy.
Chapter V—Preparations for War.
Chapter VI—War and Finance.
Chapter VII—The Offensive.
Chapter VIII—The Defensive.
Chapter IX—Change from the Offensive to the Defensive and the Reverse.
Chapter X—Operations.
Chapter XI—Base of Operations.
Chapter XII—Lines of Communication and Retreat.
Chapter XIII—Strategic Concentrations and Methods of Advance.
Chapter XIV—Special Forms of Strategic Offensive Operations.
Chapter XV—Tactical Offensive Operations with Special Forms.
Chapter XVI—Strategical Defensive Operations with Special Forms.
Chapter XVII—Tactical Defensive Operations with Special Forms.
Chapter XVIII—Special Types of Warfare.
Chapter XIX—Cooperation of the Army and Navy.
A Brief Summary of Strategical Principles.
Problem with Approved Solution given the School of the Line 1919–1920.

The second element of which notice should be taken is the historical. Military history is put in its proper position and its value is carefully estimated when the author criticises certain schools of military science that have carried the study of precedents so far "that they eschew the study of the art of war as a science but leave the student to get his ideas from the reading of history, careful observation of extensive exercises with troops and by reflection," and presents his own view that "the student must not pursue his task from the point of the historian but from that of the soldier, only being a historian long enough to become informed as to what occurred and then as a soldier applying the lessons to concrete cases." Practical application of this principle is made by the author in that he illustrates each individual phase of his subject with critical analyses of historical events most applicable thereto. And it seems true that for this end he has command of the whole domain of modern military history. All wars of importance fought during the last century and a half or two centuries are grist for his historical mill, though the Napoleonic campaigns, our own Civil War, and the World War furnish a very considerable majority of the illustrations employed. All this material he handles with such dexterous facility as could be made possible by nothing less than through familiartiy with it.

Incisive psychological analysis shows itself dominantly in the first two chapters, which are largely by way of introduction. This is perhaps espe-

cially true in his estimate of those elements because of which the Germans so many times just barely failed—but therein failed completely—to "put it over." He says:—

There are other conditions and circumstances that influence the conduct of battles and campaigns than mere principles. Some of these conditions and circumstances are those of morale and the training of troops, difference in leadership, difference in the support afforded by the people of the country, and so on. In other words, psychology. If there is any one thing that the Prussian system of training did not teach, it was that. The art of war is not an exact science, but the Germans apparently thought it was. By all rules of the game, Belgium should not have been foolish enough to have resisted; South Africa should have thrown off the British yoke; the Indian princes should have taken up arms in revolt; and the United States, having no definite military policy, should not have been able to raise an army. The estimating of these conditions and circumstances is the true test of ability in the application of the principles and precepts of war. The use of the retreating defensive by the French, culminating in the battle of the Marne in the recent war, was only possible for the reason that the French people were with the government, body and soul, and had a heart in the war. The advance of the allies toward France in 1815 was along the same line, yet Napoleon was not able, nor did he dare to take up the defensive for the reason that French people, as a nation, were tired of war and would not have submitted voluntarily to another invasion. So we see from this illustration, more or less fresh in our minds, that we may have two cases almost exactly alike and yet, for reasons other than strictly military, requiring the application of different principles. The difference in the capacity of commanders also exerts a great influence in the application of principles. An audacious general will take the offensive, although not without due preparation, while a weak and vacillating man will fall back on the defensive or, if he takes the offensive, do it without proper preparation. The plan of operations contemplated by Napoleon III for the invasion of Prussia in 1870 was almost exactly the same that his illustrious uncle carried out in 1806 against the same foe. The plan in 1806 succeeded because a master was in command, but so much cannot be said for the plan and the commander in 1870. When Sherman, before Atlanta, heard that Hood had succeeded Johnston, he got ready for an attack and was not disappointed. He became familiar with Hood's sanguine and impetuous temperament while with him in the Corps at the United States Military Academy. . . . The Germans in the recent struggle lost because their continued military study had made them think that their deductions and calculations were infallible. A little country like Belgium should not have had the audacity to stand against colossal Germany; but if it did have the audacity, it should not have been strong enough to have made any impression. Modern fortifications should not have been strong enough to have delayed the advance of an army supported by modern artillery. But the Belgians did have the audacity, they were strong enough to delay the Germans, and their fortifications at Liege were strong enough to hold up the advance for several days, with the result that the Germans arrived on the Sambre to find the French and British Expeditionary Forces waiting for them. Take all the necessary precautions, take a liberal factor of safety, and then go ahead. Captain Mahan, in referring to the allegation that Nelson and Farragut were foolhardy, denied it and stated "the average man wants to be too much too sure of success before he will start." George B. McClellan was a good illustration of a man who wanted to be perfectly sure of success. In modern war our curbstone strategist and vinegar barrel tactician has all the necessary confidence in himself, but no one else has. He can always fight the war better than the general in command and does not hesitate to say so, meanwhile keeping well away from the recruiting office. A famous orator, probably known to you, once announced in stentorian tones that "ere the sun sinks over the horizon on the day the President issues a call, a million men will spring to arms." He lulled many of his

hearers to sleep by his rhapsody and they awoke to find out that it was over a year after we had gotten into the World War before we had a million men in France.

Enough of the author's own words have been given to proclaim him beyond doubt a teacher, a psychologist and a soldier. A second reading—at most—of the first two chapters will not fail to awaken recognition of the scholarly style in which his thought is clothed. Many textbooks, and many otherwise excellent analyses are sadly lacking when examined from a rhetorical point of view. Not so here. The author's views are stated with all the force and dignity that may be encompassed through a firm grasp upon all necessary implements of rhetoric. Witness:

Weak states, surrounded by powerful neighbors, are in perpetual peril of annihilation and absorption. They consequently should not take up an attitude likely to invite aggression from stronger powers, nor should they seek by arms to do that for which their armament is inadequate. The Boers, in 1899, threw down the gauntlet to the Briton when they themselves could not muster more than 80,000 fighting men. It is true that President Kruger expected intervention, a condition that generally follows military success on a no uncertain scale. Feeble Denmark, in 1864, did not escape despoliation by Prussia, even though she was passive, and the provinces of Schleswig and Holstein were taken from her only to be returned when her despoilers were in turn overcome. Many wars have been waged in the past solely for the aggrandizement of the aggressor. Frederick the Great wanted Silesia, so he began the first Silesian War. Cavour sent the Italians to fight in Crimea, not that his country had any cause of offence against Russia, but because he aimed at raising its position among nations, and had hoped for future aid in working out his scheme for the unification of Italy under the House of Savoy. Napoleon III desired the Westphalian coal fields; Frenchmen wished for the frontier of the Rhine and had their over-weening military vanity offended by the Prussian victories over Austria in 1866. Bismarck was not averse to a war with France, and rendered it inevitable by deliberately altering a telegram, because he believed that the conflict would consolidate Germany and aggrandize Prussia. Germany, in the recent war, looking for her "place in the sun," could only be seeking it politically, for commercially, by legitimate means, she was crowding out her greatest competitor, Great Britain. States which through neglect or indifference allow their military organization and means of defense to decline conjure up a danger through their own fault and from which they will some day reap inevitable ruin and destruction.

This volume is one of which the United States Army and its General Staff should be proud.

A. N. Tasker.

Development of Tactics—World War. by Balck, Lieutenant General, German Army. Translated by Harry Bell, with eighteen sketches. 8°, 295 pp. The General Service Schools Press, Fort Leavenworth, Kansas, 1922.

This volume from the pen of a high officer of the German Army has been translated and published by the General Service School Press at Fort Leavenworth. In reality the book is a review of German tactics employed during the World War. The introductory chapter on "Training in Peace and Reality in War" shows that, while military knowledge is, in the last analysis, acquired, at least in its refinements, by actual experience in war, times of peace must nevertheless be employed in such military training as is possible without actual hostile opposition. To what extent such peace-time training may fail in reality to prepare for a conflict is suggested by the statement that

It is very probable that the cavalry especially suffered from "Review" tactics, for it rode charges in autumn maneuvers until shortly prior to the World War. These charges gladdened every military eye, but they could never have been executed in that manner under actual fire.

The stress which is laid upon the importance of a study of military history must be interesting to all who maintain an interest in historical research, no matter what the specific field of its activity.

Actual experiences in war, which each one can gain only in a limited way, are of inestimable value; but they can produce fruitful effect only if they are thoroughly proven and utilized by the study of military history. And still, how quickly do actual war experiences fade away!

Again:

Military history offers the possibility to properly learn the decisions that were of decisive importance, which, in exercises on the map or on the drill ground, seldom come into account. For conduct of war we have to learn from foreign experiences; our own experiences come too dear and almost always too late. "Military history is no manual containing well-formed theories, is no volume to pass the time in reading, but is a careful teacher, who enables us, if we are attentive, to view things and to conceive their value, as we would never have seen in life. At any moment we may face in the same, or an entirely changed form, questions demanding responsible, decisive and nevertheless immediate action. Of course, military history offers us in outline only the events. But it also offers what the very best theory can never offer, the picture of frictions in war, the picture of the influences of the doubts, of the urgency, of the incalculable chances, of the surprises, of the obstacles; it recounts the road which the commander and practical military knowledge have to take to overcome these difficulties; it prepares the normal counter-poise for the moment of action; it should prepare us also for the unexpected. Military history should take the place of actual experiences in war. Our life is not long enough to gather these experiences up to the moment of action."

Concerning the necessary elasticity of field service regulations the author quotes from the military phantasies of Prince de Linge written in 1783:

A paragraph that ought to be incorporated in all regulations, and that we omit, I do not know for what reason, is that we should occasionally act contrary to regulations. We must teach action contrary to regulations just as well as we must teach disorder among troops, for it will happen in battle.

The author then proceeds to amplify this principle.

The experiences in war on the part of our regiments show that bullets quickly write a new tactics, that bullets make short work of obsolete formations and create new ones. But at what cost? . . . At the outbreak of war the usual custom is to prepare troops that have been trained under obsolete regulations, for fighting on a strange theater of war by certain "Field Service Regulations." . . . It is very desirable that the first experiences in battle become the general property of all concerned as rapidly as possible. In 1870 we did not do this, and all units had to gather their own experiences. As late as August 18, 1870, the 85th Fusilier Battalion advanced in columns toward the center, though the campaign in Bohemia had shown that that formation was completely obsolete. In the World War, the experiences gained at some one point were printed and thus quickly became the general property of all. The impulse to gain and spread experiences worked especially well on tranquil fronts. Extraordinarily much was accomplished by establishing schools in order to make officers of all ranks, under officers of the special arms, familiar with the latest experiences. But this method sufficed only when the troops, by the method of their training in peace, had

gained the necessary ability to adapt themselves thereto. Training regulations should not emphasize the matter of formation; they should induce every one to practical cooperation.

The psychology of war, and especially of victory, is summed up in a paragraph which he quotes, but whose source he does not give.

"But let us not believe that at any time any technical inventions, even if they are ever so enormous, will be able to change even the very least bit of the nature of war. It is true that they may change the forms, but they will never touch war's inner core. The capability to be victorious is not naturally inherent to any people. It cannot be borrowed from nature for eternity. No; the capability for victory must be educated into the people and into the army and must be maintained by strict performance of duty. Maintenance is frequently more difficult than acquisition. Two races, two nations, may be physically equal and have the same intelligence, but if in case of one of them the capability of greater sacrifices by the individual, and thus by the entire people, is less than is the case with the other, it is as certain as the sun rises in the morning and sets at night, that war will pass its hard judgment on the lesser sacrifice."

Following the introductory chapter there is one on "Mobile Warfare" which is subdivided into (*a*) Training and Organization, (*b*) Tactics of Mobile Warfare, (*c*) Changes in Organization, Equipment and Armament, and (*d*) Training Regulations for Foot Troops. The third chapter deals with "Position Warfare in the West, 1914–1917," under the captions of (*a*) Origin and Nature of Position Warfare, (*b*) The Position Battles Up to the First Attack on Verdun, (*c*) Lessons of the Battle on the Somme and the Battles in Front of Verdun in the Late Fall of 1916, (*d*) Utilizing the Experiences Gained, and (*e*) The Battles in 1917. "The War in the East and in Italy" constitutes the subject matter of the fourth chapter, which again is considered under certain subheadings: (*a*) Russia, (*b*) Battles in Northern Italy, and (*c*) Mountain Warfare. "Technique in War" (Chapter V) considers transport service, tanks, concrete construction, light and water supply, infantry, telephone communication, relay messengers, wigwag signaling, carrier pigeons, war dogs, message projectiles, flashlight stations, wireless telegraphing and ground telephone, false signals, aeroplanes, screening tactical positions and camouflage, gas weapons, and minenwerfers. Subsequent chapters deal with "The Defensive Battle in Position Warfare," "German Attacks with Limited Objectives," "Machine Guns," "The Infantry Attack in Open Warfare," "Cavalry," "Artillery," "The Battles in 1918," and a Conclusion in which the present attitude of Germany toward the war, its results, and the future, as seen by the author, is set forth.

The World War found a premature end through political events in Germany, without additional battles having been able to prove the correctness of our new defensive method. Great General Headquarters had the fullest confidence in these general rules, though it did not underestimate the value of the hostile procedure of the offensive, the influence of superiority of numbers, and the importance of the hostile fighting means. The high command reckoned on success, or at least on gaining time, in the defense of the expected Antwerp-Meuse position and also in further battles. But things happened differently! The army at home knifed the undefeated field army in the back, like Hagen of old did to the unconquerable valiant hero, Siegfried. The lessons of history were not written for us; our peoples trusted to the "good-heartedness" of unforgiving enemies, who concealed their hatred under the banner of the League of Nations. Our peoples were to find out for themselves "*Vae victis!*"

Supported by weak allies, the German army had opposed for almost four and one-half years a world of enemies, who had at their disposition all means of industry and technique, of foodstuffs and raw materials. If we seek for the criminal responsible for our fall, he should be sought, not in the army, but he should be sought in the ranks of the leaders of our political parties, in the ranks of the men who placed pursuit of their own ends above the weal and woe of Germany. In the territory of the enemy, the army has secured its greatest achievements, and was very near in reaching an advantageous peace. In the foregoing pages no one should seek for errors; they are only for the purpose of information of what we have done, so that the reader may proudly look back on the achievements of our people under arms. The ignominious peace of Versailles is for the sole purpose of making us helpless and consequently no longer dangerous. Can the annihilation of our peoples be God's will? We do not believe so. Our peoples have given too many proofs of their efficiency to permit a stroke of the pen of the Entente to annihilate them. In spite of all difficulties piling up in front of us, I firmly believe in the future of our peoples. German power may be lamed for years, but the German spirit cannot be killed. The German spirit will continue to live!

When later on a new aurora of history embellishes our days, then may our peoples remember also our heroes of the World War. Work, suffer, and fight like they did, and thus Germany's future will be secure. And then, also, the blood of our heroes who fell in the belief of Germany's victory will not have been spilled in vain!

The volume includes certain sketches whose captions indicate that phase of the printed text which they severally illustrate: "French Battalion in Attack Formation," "Company Column," "Fortifications Prior to the Autumn—Battle in the Champagne," "Arrangement of the Field of Attack According to Joffre's Plan," "Map of the Battle of the Somme," "Company in Lozenge Formation," "Formation of a Battalion (1917)," "Platoon in Formation under Hostile Artillery Fire," "A British Tank Attack, 1918 (Position in Readiness—Advance Guard)," "Formation of a Battalion in Attack from Trench to Trench, Piercing Depth into the Trench System That Is To Be Held about 500 Meters," "Machine-Gun Equipment at the Outbreak of the World War," "Position of Machine-Gun Company," "Example of the Formation of One Company at Opening of Fire."

The translator is to be congratulated upon the excellence of his translation. It is entirely free from that barbaric contravention of good English usage which so often results from a too servile adherence to the principle of literal translation.

A. N. Tasker.

A Textbook of Therapeutics, including the Essentials of Pharmacology and Materia Medica, by A. A. Stevens, A.M., M.D., Professor of Applied Therapeutics and Clinical Medicine in the Woman's Medical College of Pennsylvania, Philadelphia; Visiting Physician to the University and the Philadelphia General Hospitals. 6th Edition, 8°, 793 pp. Philadelphia and London: W. B. Saunders Company, 1923.

The sixth edition of Dr. Stevens' classical "Textbook of Therapeutics" can be proven by comparison with the fifth edition to have been very largely rewritten. The changes introduced have been necessitated by the extraordinary advances made in recent years in pharmacology and applied therapeutics. A very considerable list of new therapeutic agents which were not mentioned in the fifth edition appear in the present volume. These are:

Benzyl benzoate, papaverin, pituitary extract, thyroxin, thromboplastin, methyl alcohol, benzyl alcohol, mercurochrom, geranium dioxid, emetin, yeast, acid sodium phosphate, aluminum chlorid, phenobarbital (luminal), cinchophen (atophan), silver arsphenamin, acriflavin, proflavin, surgical solution of chlorinated soda, chloramins, scarlet red, quinidin, ethyl-hydrocuprein (optichin), surgical paraffin, carbon dioxid snow.

In general the order of arrangement follows that of the earlier editions. That is to say, the first division gives in its opening paragraphs the definitions of materia medica, pharmacology or pharmacodynamics and therapeutics. The composition of drugs, the preparations of drugs, incompatibility in prescriptions, methods of administering drugs, and conditions modifying the effects of drugs, are next considered. Circulatory stimulants, circulatory depressants, vasoconstrictors and vasodilators, respiratory stimulants and depressants, cerebral excitants, cerebral depressants, and somnifacients are discussed. A subsection is given to general anaesthetics, another to antitoxins, still others to antispasmodics, spinal cord excitants, spinal cord depressants, motor nerve stimulants, motor nerve depressants, and sensory nerve depressants. The action of drugs on the sympathetic or autonomic nervous system receives two pages of general discussion, and is then subdivided into more detailed reference to mydriatics, the myotics, the emetics, and the antiemetics. Drugs exerting their particular effects upon the gastro-intestinal system are described under the general heading of gastric antacids, stomachics, digestants, carminatives and cathartics. Diuretics, stimulants to the urinary tract, uric acid solvents, aphrodisiacs and anaphrodisiacs, emmenagogues, oxytocics or ecbolics engage attention as constituting groups of drugs whose principal activity is observed in connection with the genito-urinary system. The pharmacology of the skin and mucous membranes is cited under "diaphoretics or sudorifics." Antihydrotics and expectorants, the tonics, the alteratives, the antipyretics or febrifuges, the astringents, the hemostatics, the germicides, antiseptics and deodorants, the antimalarials, the anthelmintics, antitoxins and vaccines, yeast, the irritants and counterirritants, the escharotics or caustics, the protectives, and flavoring agents and vehicles, are a group which, in the order named, complete that portion of the book dealing with drugs.

Remedial measures other than drugs are discussed under the captions "electricity," "massage," "movement therapy for locomotor ataxia," "the Schott or Nauheim treatment," "cold," "heat," "hypodermoclysis and infusion," "enteroclysis," "lavage of the stomach," "blood letting," "treatment by hyperemia," "spinal puncture," "Roentgen ray treatment," "radium" and "actinotherapy."

Another section of the book takes up the subject of therapeutics from a different angle in that it deals with the treatment of individual diseases,—in other words, applied therapeutics. The individual diseases thus referred to are typhoid fever, lobar pneumonia, cerebrospinal fever, erysipelas, septicemia, septicopyemia, tetanus, diphtheria, influenza, bacillary dysentery, cholera, anthrax, tuberculosis, syphilis, scarlet fever, smallpox, measles, rubella, mumps, whooping cough, acute rheumatism, acute poliomyelitis, epidemic encephalitis, malaria, amebiasis, actinomycosis, scurvey, rickets, obesity, adiposis dolorosa, gout, diabetes mellitus, diabetes insipidus, stomatitis, acute tonsillitis, chronic tonsillitis, acute catarrhal pharyngitis,

chronic pharyngitis, acute gastritis, chronic gastritis, hyperchlorhydria and gastric hypersecretion, atony of the stomach, ulcer of the stomach and duodenum, carcinoma of the stomach, dilatation of the stomach, hematemesis, acute enteritis, chronic enteritis, diarrheal disorders of early childhood, acute appendicitis, mucous colitis or mucous colic, chronic constipation, visceroptosis, catarrhal hepatitis, catarrhal jaundice, chronic cholecystitis and cholelithiasis, cirrhosis of the liver, acute and chronic pancreatitis, coryza, epistaxis, acute laryngitis, spasmodic croup, edema of the larynx, acute bronchitis, chronic bronchitis, asthma, hayfever, bronchopneumonia, pulmonary emphysema, edema of the lungs, hemoptysis, pleurisy, empyema, pneumothorax, acute myocardial disease, chronic myocardial disease, acute heart failure, angina pectoris, acute benign endocarditis, acute malignant endocarditis, subacute infective endocarditis, chronic valvular disease, acute pericarditis, arteriosclerosis, aneurysm of the aorta, arterial hypertension, arterial hypotension, acute nephritis, chronic parenchymatous nephritis, chronic glomerulonephritis, chronic interstitial nephritis, pyelitis, pyelonephritis, nephrolithiasis, hematuria and hemoglobinuria, secondary anemia, chlorosis, pernicious anemia, leukemia, Hodgkin's disease, erythremia, hemophilia, primary purpura, hemolytic jaundice with splenomegaly, splenic anemia (Banti's disease), simple or non-toxic goiter, exophthalmic goiter, secondary hyperthyroidism (toxic goiter), hypothyroidism (myxedema), Addison's disease, acromegaly, hypopituitarism, status lymphaticus, arthritis deformans, osteomalacia, lumbago, progressive muscular dystrophy, myasthenia gravis, neuritis, multiple neuritis, sciatica, neuralgia, herpes zoster, cerebral hemorrhage, cerebral thrombosis and embolism, tumor of the brain, infantile cerebral paralysis, chronic hydrocephalus, tabes dorsalis, paretic dementia, lateral sclerosis, amyotrophic lateral sclerosis, progressive spinal muscular atrophy, chronic progressive bulbar palsy, disseminated (multiple) cerebrospinal sclerosis, acute myelitis, infectious chorea, paralysis agitans, tetany, tic, epilepsy, neurasthenia, hysteria, writer's cramp, migraine, Raynaud's disease, angioneurotic edema, acroparesthesia, thermic fever, heat exhaustion, heat cramps, acne vulgaris, eczema, psoriasis, rhus poisoning, boils, impetigo contagiosa, urticaria, ringworm, and seborrhea. A table of weights and measures and a very complete index conclude the volume.

Since the appearance of the first edition in 1894, this work has stood as a classical authority in therapeutics. The painstaking care with which the author has followed all advances in the subject with which he deals is too well known to the medical profession of America and other countries to need emphasis. Suffice it to say that critical examination of the sixth edition proves beyond possibility of contradition that there has been no letdown from the high standard of excellence maintained in the earlier editions.

A. N. Tasker.

The Heart in Modern Practice; diagnosis and treatment, by William Duncan Reid, A.B., M.D., Chief of Heart Clinic at the Boston Dispensary, Junior Assistant Visiting Physician and Member of the Heart Service at the Boston City Hospital, Formerly Assistant Visiting Physician to Outpatients at the Massachusetts General Hospital. 32 illustrations, 8°, 352 pages. Philadelphia and London: J. B. Lippincott Company, 1923.

The development of electrocardiography and of other measures of precision in investigation of the heart have within recent years greatly

advanced the medical profession's knowledge of that organ not only in respect to its physiology but in all that concerns its pathology as well. The present volume is a valuable compendium of such recently acquired information added to the older fundamental considerations of anatomy, physiology, and embryology.

The paper, printing and binding are comparable to those features found in all professional books published by Lippincott. Bibliographical references are found on a large majority of pages in the form of foot-notes. The author may be described as conservative in the matter of illustration, but such illustrations as do appear are of the best.

Perhaps one of the most interesting chapters is that on cardiovascular syphilis wherein it is shown that "Infection of the heart and the aorta by the spirochaete of syphilis produces one of the most important types of heart disease." Fronting the page upon which this statement appears is found a photomicrograph showing spirochaetes in the myocardium, while the obverse of that particular leaf is occupied by an histological picture of syphilitic myocarditis. It is a startling fact that syphilitic changes are found in the cardiovascular system of 3.5 to 7 per cent of all individuals coming to autopsy, and in 75 per cent to 85 per cent of all known syphilitics upon whom necropsies are performed. Truly the protean nature of syphilis becomes daily more and more manifest.

Not the least valuable portion of the book is the appendix in which are reported cases illustrative of the various modalities of heart disease.

A. N. Tasker.

The Aviator, by Henry C. McComas, Professor in the Division of Science at Princeton University; Formerly Captain, Sanitary Corps, U. S. Army, at the Research Laboratory, Hazelhurst Field, Mineola, L. I., N. Y. 8°, 214 pp., 14 illustrations. New York: E. P. Dutton & Company, 1922.

This small volume from the pen of Professor McComas deals with the physiology and psychology of the aviator. "Instead of thinking of the plane as a person think of the pilot as a machine!" "The art of flying calls for an activity of the brain and nervous system of a peculiar kind." The general trend of discussion to which this work is devoted may be indicated by the captions of the individual chapters:

I. The Aviator as a Machine.
II. Nerve and Nerves.
III. Controlling the Plane.
IV. The Sense of Motion and Balance.
V. Vision in the Air.
VI. Other Senses.
VII. The Feel of the Ship.
VIII. Oxygen and Efficiency.
IX. Doing Stunts.
X. Selecting the Aviator.
XI. Types of Airmen.
XII. The Pilot as a Personality.

The whole book is written in a style that engages and holds the attention from one end to the other. It presents an enormous number of scientific data in non-technical language and in a conversational tone which is not

usually characteristic of such writing. In particular the last chapter on "The Pilot as a Personality" is of great "human" interest.

What then is meant by *personality?* Ordinarily we entertain very vague ideas about it. Often it serves as a convenient word to cloak an indefinite idea. We speak of the personality of a musician in interpreting music, or of an actor in presenting his rôle, because we cannot indicate clearly the features which distinguish the work. We realize that it is unique and peculiar to a particular artist, and the word "personality" is a useful means of escaping a clear analysis. The same vagueness characterizes our practical conceptions of personality. Some people impress us in one way, some in another. Differences in bearing, voice, gestures, clothing, topics of conversation and numerous other particulars go into the making of certain types of personalities as we understand them. Frequently, our habitual way of "sizing a man up" is successful and the first impressions are verified by later acquaintance. We use a crude practical method of classifying new acquaintances, according to the features which happen to impress us. And we call the impression an interpretation of personality. With fuller acquaintance each person gradually assumes an individuality of his own, a personality of his own.

Historically, the word originated from the Latin term "persona," meaning a mask, which was worn by an actor in a play. Later the "dramatis personae" were the characters in the play. Each actor was distinguished by his "persona." Thus the term comes to indicate, as the Standard Dictionary states, "the attributes taken collectively, that make up the character and nature of an individual; that which distinguishes and characterizes a person."

What these components are that enter into the making of a personality is still a debated question. The ancients ascribed four temperaments to mankind and sought to find a physical basis for them. The same effort reaches to our day, and various physical characteristics are found to account for differences of personality. One interesting attempt is the tracing out the similarities in character and tastes of *identical* twins. Here we have exactly the same heredity, and the physical features are astonishingly alike. The whorls in the skin of the finger tips are of the same pattern; in the few cases studied the configurations of the brain and the bundles of muscles are strikingly similar. In many instances the likes and dislikes, the mental ability, are as similar as size, weight, and expression. Such studies stress the physical basis of personality. So, too, do many investigations into altered personality. Cases are to be found in every state hospital of changed personality due to disease. An ambitious attempt has been made to interpret the personality of famous men in terms of physical characteristics. An example might be cited to illustrate this kind of theory. Carlyle and Stevenson were both Scotch authors. Something of the Scotch temperament may be found in the writings of each, but Carlyle is characterized by a melancholy and pessimism while Stevenson is sparkling with a wholesome optimism. Carlyle was suffering from an intestinal disorder which invariably makes for melancholy. Stevenson was dying with pulmonary tuberculosis which brings into the constitution a toxin that affects the nervous system in a characteristic way. It gives a peculiar sense of well-being and an attitude of cheerfulness toward life.

Illustrations of this sort are rather spectacular and may be challenged, but the idea involved is an old one; namely, that changes in the physical constitution bring about changes in one's moods, feelings, ideas and temperament. So well grounded is this principle that it is not uncommon to find medical men assuming that the whole of one's personality is a matter of heredity and development of the physical organs, especially the glands of internal secretion. However, the experience of every observant man leads him to the conviction that there is something more entering into the making of his personality. Incidents occur in everyone's life which affect the habits of thinking and acting. Friendships often alter the personal habits of a young man. The association with men of exceptional character or genius,

makes a youth take on some of the traits of the stronger and more mature nature. Education is based on the principle that human nature is plastic, and not only the intelligence, but the character may be fashioned according to set plans. It is a common remark in English educational circles that men coming up to Oxford, or Cambridge, can be identified very easily with certain historic schools such as Eton, or Harrow, where they prepared. These historic schools develop definite types of men. Our West Point men are trained to work hard and to stick to a problem until they have worked their way through it. They are disciplined in stating their results clearly and definitely, regardless of anything but the facts stated. Such practices develop mental habits and moral character as well. Truthfulness is a habit of men trained in this way.

All sorts of modifications of one's inherited traits may be brought about by direct education and by direct influences. Teachers frequently impart more by way of their personal characteristics than through their careful instructions. In aviation this was often illustrated. Instructors who had confidence in themselves unconsciously inspired their pupils with confidence. Men who were methodical and careful in their inspection of the airplane before going up, and who systematically conformed to the flying rules of the field, had no difficulty in obtaining an unconscious imitation on the part of their students. More subtle traits were also contagious. Clean-minded men, real sportsmen, gentlemen by birth and breeding had a definite influence upon the young cadets who were being trained by them. Several cadets, who had always lived in rather restricted environments, confided to me that the best thing they had obtained from their flying instruction was the association with a class of men whom they had never met before. Unfortunately, there were instructors who prided themselves on being rough, "hard boiled" types. I remember the reaction of one cadet to such a man. His instructor cursed him thoroughly on the ground and in the air for any little awkwardness he showed. During one flight the cadet's patience gave way and he arose, turned around, shook his fist at his teacher and cursed him, with a complete indifference to the airplane, the Army Regulations and the English grammar. Such occurrences were not frequent, at least in my observations. The type of instructor was usually one which the student respected.

All those who look up to the air with awe when the "blimp," the big bomber, or the little stunt plane are passing, would do well to give up the few hours necessary to a perusal of this volume. Their knowledge and appreciation of all that is involved in aeronautics would of necessity be enormously enhanced thereby.

A. N. Tasker.

Practical Local Anesthesia and Its Surgical Technique, by Robert Emmett Farr, M.D., F.A.C.S., Minneapolis, Minn. Illustrated with 219 engravings and 16 plates. 8°, 529 pp. Philadelphia and New York: Lea & Febiger, 1923.

It is a pecular fact that dentistry has evolved for itself a much more rational attitude toward local anesthesia than has the medical profession. It probably cannot with truth be said that local anesthesia in dentistry possesses any marked degree of superiority to general anesthesia which does not also hold good in the case of general surgery. But the dentists have, within their more restricted field, brought the use of local anesthesia into relatively much more extensive use and to a point more nearly approaching technical perfection than has been true with surgeons in general. Such conservatism on the part of medical men is traditional, and also praiseworthy, if it be not so "hidebound" as definitely to interfere with progress and thus constitute an ultraconservatism.

In the present volume the author has given a remarkably complete description of the indications and technique of local anesthesia. A complete list of the individual subjects treated would be so long as almost to prohibit publication in a single number of THE MILITARY SURGEON; but a certain number of the "high spots" may be indicated. These are as follows: "The General Anesthetics," "The Local Anesthetics," "The Anesthesia Problem," "Equipment and Armamentarium," "General Technique," "The Anatomy of the Sensory Nervous System," "Local Anesthesia in Surgery of the Head and Face," "Local Anesthesia in Surgery of the Neck," "Local Anesthesia in Surgery of the Breast, Thorax and Spine," "Local Anesthesia in Surgery of the Extremities," "Local Anesthesia in Surgery of the Genito-Urinary System," "Local Anesthesia in Surgery of the Rectum and Anus," "Local Anesthesia in Surgery of the Abdomen," "Local Anesthesia in Surgery of the Abdominal Wall (Hernia)," "Local Anesthesia in Surgery of the Upper Abdomen," "Local Anesthesia in Surgery of the Intestines," "Local Anesthesia in Surgery of the Appendix," and "Local Anesthesia in Surgery of the Pelvis."

In physical characteristics (binding, paper, printing, etc.) the volume is beyond possibility of adverse criticism. It is also rich in illustrations of the most instructive sort after the manner of modern textbooks dealing with surgery. For the specialist in anesthesia it will be an invaluable book of reference. The general surgeon who hitherto has neglected to inform himself thoroughly concerning the field of local anesthesia, cannot fail to be impressed by even casual examination of this work with the technical possibilities of local surgical narcosis.

A. N. TASKER.

EXERCISE IN EDUCATION AND MEDICINE, by R. Tait McKenzie, M.D., LL.D., McGill University; Late Major, R. A. M. C.; Professor of Physical Education and Physical Therapy and Director of the Department of Physical Education, University of Pennsylvania; Fellow of the College of Physicians of Philadelphia; President of the American Physical Education Association, 1913–1915; President of the Society of Directors of Physical Education in Colleges, 1912; Sometime Lecturer in Anatomy and Medical Director of Physical Education at McGill University; Lecturer in Artistic Anatomy, Montreal Art Association, Harvard Summer School, and Olympic Lecture Course, St. Louis, 1904; M. P. E., Springfield College. Third edition, thoroughly revised. 8°, 601 pp. Philadelphia and London: W. B. Saunders Company, 1923.

The rational evaluation of the benefits of physical training for all groups of persons on the part of educators has been retarded by the fantastic and wholly unwarranted claims of numerous "self-elected professors," who have succeeded in extracting from the pockets of the general public many good dollars for directions as to the use of their widely advertised "systems" warranted to metamorphose a pigmy into a Sampson overnight. It is refreshing for those who look upon well-ordered muscular exercise as an essential portion of a normal individual's daily routine, to meet tangible evidences of the fact that this subject is being put into its proper place in the curriculum of our institutions of higher learning. Among such evidences the third edition of Dr. McKenzie's "Exercise in Education and Medicine" holds an impressive position.

The term "exercise" he defines as comprising "all movements, voluntary or passive, including manipulations by the hand of an operator or by a machine, designed to act on the muscles, the blood vessels, the nervous system, the skin, and the abdominal organs. . . . It naturally falls into the two main divisions given by Plato—active and passive. Active exercise requires a definite exertion of the will power, whether in its more complicated form of games and gymnastics or in simple duplicate directed movements with assistance or resistance by the hands of an operator or by a machine. Passive exercise does not require any exertion of will power. The various manipulations of massage, by means of the hands, or by the machines of Zander and others, by which contracted ligaments or muscles are stretched and nourished, local nutrition improved, nerves stimulated, and the abdominal organs affected, are restful rather than exhausting to an overwrought brain."

The physiology of exercise, its relation to age, sex, and occupation, the systems of exercise evolved by various nations and their results, physical education in connection with academic instruction, and the physical training of defectives of various sorts are treated in the first part. The second part is given over to "Exercise in medicine," and the scope of the author's treatment of this phase of the subject is indicated by the following list of titles: "The Application of Exercise to Pathologic Conditions," "Massage and Vibration," "Mechanical Means for Massage and Muscular Reeducation," "Flat-Foot and Club-Foot—Their Treatment by Exercise," "The Cause and Treatment of Round Back, Stooped, and Uneven Shoulders," "Scoliosis—Its Causes, Varieties, Diagnosis, and Prognosis," "The Treatment of Scoliosis," "The Treatment of Abdominal Weakness and Hernia by Exercise," "Treatment of Visceroptosis and Constipation, and Disorders of the Digestion, by Massage and Exercise," "Treatment of Respiratory Diseases by Exercise and Forced Respiration," "Exercise in Treatment of Diseases of the Circulation," "Obesity: Its Causes and Treatment," "Exercise in the Treatment of Nerve Pain and Exhaustion," "Tic, Stammering, and Chorea," "Infantile Paralysis from Anterior Poliomyelitis," "Treatment of Locomotor Ataxia by Exercise."

A critical examination of this portion of the book shows with what detailed thoroughness the author has studied the various paralyses, deformities, and postural defects, and with how careful an investigation of the disturbances of mechanical principles involved in such abnormal states he has put himself to the task of explaining the proper function of physical education in their treatment. The volume will be a valuable addition to the library of every orthopedic surgeon, neurologist and physiotherapist.

A. N. Tasker.

Sanitary Entomology, The Entomology of Disease, Hygiene and Sanitation. Edited by William Dwight Pierce, Ph.D., Consulting Entomologist; formerly Entomologist Southern Field Crop Insect Investigations, United States Department of Agriculture, Bureau of Entomology. 8°, 518 pp. Boston: Richard G. Badger, The Gorham Press, 1921. Price, $10.

This work is an elaboration and revision of a series of lectures delivered in 1918 in mimeographed form to a class of some five hundred American entomologists who desired to equip themselves for any special war service that they might be called upon to render

The subject-matter of the book therefore deals chiefly with military and domestic problems. The subjects are well chosen and the material clearly presented. The work will appeal strongly to those interested in the practical side of entomology particularly sanitarians and agriculturists. Of the thirty-five chapters, twenty are written by Dr. Pierce, two by him in collaboration and thirteen by other authors. The chapters are as follows:

I. "How insects can carry or cause disease."

II. "Some necessary steps in any attempt to prove insect transmission or causation of disease."

III. "A general survey of the needs of entomological sanitation in America." How to improve farm, town and city sanitation.

IV. "A general survey of the seriousness of insect borne diseases to armies." Selection of the camp site, a consideration of the need for specialists in the prevention of the admission of infested recruits and prophylaxis against vermin, the destruction of waste from the human body and garbage, the construction of incinerators and latrines.

V. "Relation of insects to the parasitic worms of vertebrates." The only important rôle played by insects in the propagation of parasitic worms is that of true mematode hosts necessary to the existence of the parasites in some of their stages of development. There are considered the mode of infection of insect hosts, the mode of infection of vertebrate hosts and the species of worms found in insects. For example, on page 59 there is a valuable table of flukes, their insect hosts and final hosts.

VI. "The relations of climate and life and their bearings on the study of medical entomology." Briefly expressed, the chapter shows that the two important factors having a bearing on climate and life are temperature and relative humidity. There are tables showing zones in which various phases of animal life may exist beginning with the zone of thermoplegia or heat stroke through the practicotatum or zone of optimum activity to the zone of rhigoplegia or freezing to death. There is a similar chart showing responses to various degrees of humidity.

VII. "Diseases borne by non-biting flies." Discussed here are the principal house-visiting flies and their transmission of animal and plant organisms with the production of various localized diseases, septicaemia, intestinal diseases and possibly such general diseases as poliomyelitis, smallpox, measles, etc.

VIII. "Important phases in the life history of non-biting flies."

IX. "Common flies and how to tell them apart." This chapter contains tables for the aid of the student in separating the adult flies and also the larvae or maggots.

X. "The control of the house fly and related flies." The chapter emphasizes the principle that the fly must be fought while breeding and before it has a chance to spread disease. Among the repressive measures striking at the source are the care of manure, garbage, excreta, carcasses, and miscellaneous breeding places. The palliative measures are screening, fly traps, fly papers, poison baits, fly sprays and the protection of animals.

XI. "The control of flies in barn yards, pig pens and chicken yards."

XII. "Myiasis—Types of injury and life history, and the habits of species concerned." From the standpoint of the method of attack the subject is divided into the following groups: Tissue destroying forms, subdermal migratory forms, larvae infesting the intestinal or urogenital tracts, forms infesting head passages, and blood sucking species.

XIII. "Myiasis—its prevention and treatment." This chapter takes up the forms above listed in turn.

XIV. "Diseases transmitted by blood-sucking flies." The more important diseases due to plant organisms are tularaemia, anthrax, various types of septicaemia, pappataci fever, verruga peruviana, equine infectious anemia, hog cholera, glanders, and possibly poliomyelitis and pellagra. Those due to animal parasites are pigeon malaria and the various types of trypanosomiasis.

XV. "Biological notes on the blood-sucking flies."

XVI. "Biology and habits of horse flies."

XVII. "Diseases transmitted by mosquitoes." The first group is "Diseases of uncertain origin" for example dengue fever, and avian anemia. The second group, plant organisms, includes anthrax. The third group, animal organisms includes avian anaemia, malaria, yellow fever, filiariasis, and more rarely trypanosomiasis, and possibly leismaniasis.

XVIII. "What we should know about mosquito biology."

XIX. "Mosquito control." More money and more concentrated effort have been devoted to this procedure than in the case of any other disease-bearing insect. The more important procedures are first, the prevention of mosquito breeding, by destruction of breeding places, leveling and filling water holes, ditching and clearing streams and swamps, clearing of weed-filled bays and lakes, drainage and use of larvicides, oiling, the destruction of artificial containers of mosquito larvae, such as cisterns, latrines, tin can dumps, etc., the use of fish in mosquito control and the destruction of the adult mosquito. The second procedure is the protection of dwellings from mosquitoes and the protection of the individual.

XX. "Louse-borne diseases." Lice may cause pathological conditions either by their direct attack with the production of urticaria, eczema, dermatitis, pruritus, etc., or by transmitting diseases, the more important of which are: typhus fever, trench fever, Volhynian fever, relapsing fever, and possibly cerebrospinal meningitis, and epidemic jaundice.

XXI. "The life history of human lice," including a statement of the methods employed by investigators in breeding lice by placing them in wristlets attached to the forearms of volunteers.

XXII. "The control of human lice." First the control of lice on the body and second the control of lice in clothing by laundry methods of disinsection, dry cleaning, steam sterilization, hot air fumigation, and storage.

XXIII. "Lice which affect domestic animals" including also their control.

XXIV. "Diseases carried by fleas," the more important of which are bubonic plague, rodent plague, and possibly filiariasis.

XXV. "Life history and control of fleas."

XXVI. "Cockroaches."

XXVII. "Diseases transmitted by the cockroach."

XXVIII. "Bedbug and other bloodsucking bugs; diseases transmitted, biology and control." The points in favor of the bed bug as the vector of leprosy, plague, and poliomyelitis are given.

XXIX. "Diseases carried by mites and ticks."

XXX. "The biologies and habits of ticks."

XXXI. "Control of ticks."

XXXII. "Fleas and lice in Egypt."

XXXIII. "Insects in relation to packing houses."

XXXIV. "Insect poisoning and miscellaneous notes on the transmission of disease by insects."

XXXV. "A tabulation of diseases and insect transmission." This extremely valuable table consisting of twenty-three pages gives in tabulated form the disease, causative organism, insect transmitter, method of insect transmissions and nature of insect rôle.

The book is an extremely valuable one, and the arrangement is excellent. The various types of insects are considered, first giving the list of the diseases transmitted by that type, the organisms transmitted being arranged in systematic form. Following this there is a chapter on the biology of the insect and thirdly, a chapter on control. Each chapter contains a valuable bibliography and the photographs and text figures are numerous and

well chosen. One could wish that the volume, which is probably destined to receive hard usage, had been more strongly bound. EDGAR ERSKINE HUME.

FRANBOESIA TROPICA (Parangi of Ceylon), by R. L. Spittel, F.R.C.S. (Eng.); Surgeon, General Hospital, Colombo; General Officer in charge of Venereal Clinic, General Hospital, Colombo; Lecturer in Clinical Surgery, Ceylon Medical College. 8°, 59 pp. London: Bailliere, Tindall and Cox, 8 Henrietta Street, Covent Garden, W. C. 2, 1923. Price, 5 shillings.

This is a brief but valuable book on the subject of yaws, or parangi, as it is known in Ceylon. The author's close study of the disease in that island has enabled him to produce a monograph of great interest. The clinical descriptions of the disease in its three stages are clear, and the contrast between it and syphilis is well brought out. The chief differential points are the immunity of the eyes, mucous membranes and central nervous system to attack by yaws, also the extragenital primary lesion and the fact that yaws is never congenital. Salvarsan gives far more satisfactory results in the treatment of framboesia than in syphilis, for in the former it is almost an unfailing specific, being thus sharply contrasted with mercury to which yaws does not respond well. The value of the book is increased by numerous and well-chosen photographs. It will be of value to all students of tropical medicine. EDGAR ERSKINE HUME.

THE MICROSCOPICAL EXAMINATION OF FOODS AND DRUGS, A Practical Introduction to the Methods Adopted in the Microscopical Examination of Foods and Drugs, in the Entire, Crushed and Powdered States, by Henry G. Greenish, F. I. C., F. L. S., Professor of Pharmaceutics to the Pharmaceutical Society of Great Britain and in the University of London; Director of the Pharmacy Research Laboratory; Docteur (N.C.) de l'Universite de Paris; Hanbury Gold Medallist, 1917; Joint Editor of the British Pharmacopoeia, 1914; Late Member of the Board of Examiners of the Pharmaceutical Society of Great Britain; Late External Examiner in Materia Medica and Pharmacy to the University of Birmingham. With 209 illustrations, 3rd Edition, 8°, 386 pp. Philadelphia: P. Blakiston's Son & Co.

Texts in English on the subject of the practical laboratory examination of vegetable foods and drugs are not many though there are numerous books on related subjects which aid the student of vegetable histology. This work, therefore, will be very useful. Advances in the fields of chemical examination of foods and drugs have been great and have left that of microscopic examination far behind. The author here shows the importance of both methods and that the one is incomplete without the other. The sketches and diagrams, of which there are a great number, are excellent. The work is divided into fifteen sections, viz: "Starch," "Hairs and Textile Fibers," "Spores and Glands," "Ergot," "Woods," "Stems," "Leaves," "Flowers," "Barks," "Seeds," "Fruits," "Rhizomes," "Roots," "Adulterants of Powdered foods and drugs," and "A General Scheme for the Examination of Powders." Appendix A is a list of reagents of general utility. Appendix B is a list of the chief varieties of cell wall and cell contents and the means adopted for their identification. EDGAR ERSKINE HUME.

UNITED FRUIT COMPANY, MEDICAL DEPARTMENT, ELEVENTH ANNUAL REPORT, 1922.

This is an annual report of more than usual interest. In addition to the detailed accounts of the work done in the fields of both preventive and cura-

tive medicine, there are valuable statistical tables. An innovation is a series of "Tables pertaining to the work from 1914 to 1922." The descriptions of tropical conditions and general health measures undertaken are interesting and instructive. There are a number of excellent illustrations.

EDGAR ERSKINE HUME.

INDUSTRIAL HYGIENE AND MEDICINE, by E. W. Hope, O.B.E., M.D., D.Sc., Medical Officer of Health for the City and Port of Liverpool; Professor in Public Health, University of Liverpool; Late President of the Society of Medical Officers of Health, and Late Examiner in the Universities of Belfast, Cambridge, Edinburgh, and Manchester, and to the Royal College of Physicians (Lond.), and Royal College of Surgeons (Engl.), In collaboration with W. Hanna, M.A., M.D., D.P.H., and C. O. Stallybrass, M.D., D.P.H., Assistant Medical Officers of Health for the City and Port of Liverpool, and lecturers in Public Health subjects, etc., University of Liverpool. 8°, 766 pp. New York: William Wood and Company, 1923. Price, $7.00.

This carefully written and complete work satisfactorily deals with the general subject of industrial hygiene and medicine. The author begins with an introduction showing that the earliest medical writers recognized the dangers of certain occupations but that it was not until modern times that any attempt was made to prevent occupational disease. Factory legislation was closely connected in its beginnings with the British Commission on the Poor Law about 1833. The author traces the gradual development of this study through the various attempts made to decrease mortality and morbidity from dangerous trades, the shortening of working hours for miners, the prohibition of the use of young children of school age in factories, the appointment of inspectors, the introduction of ventilation regulations, safety devices, proper lighting, sanitary arrangements, etc.

Chapter II deals with the vital statistics of occupation. The author says that the mortality rate for persons employed in a particular industry is computed by the following formula:

$$\text{Mortality rate} = \frac{\text{Deaths in three years}}{\text{Census population} \times 3} \times 1{,}000$$

The use of the census of the average population of three years is necessary since many persons change their occupations and others migrate from one district to another within a brief period. As is to be expected in a work written by British authors chiefly for use in Great Britain, the data are derived for the most part from British sources.

Chapter III on "General Hygienic Conditions" considers the question of the lighting of factories and work places and standards of illumination where artificial lighting is required. Attention is drawn to the fact that good lighting acts in three beneficial ways. Accumulation of dirt and other defects unnoticed in dim light will be apparent under improved lighting; secondly, the germicidal effect of sunlight is important, and lastly, eyesight of the worker is protected. The ventilation of factories is considered. A desirable atmosphere is characterized by the Health of Munition Workers Committee as being cool rather than hot; dry rather than damp, divers in its temperature in different parts and at different times, rather than uniform and monotonous; and lastly, moving rather than still. The many types of ventilation apparatus in use are described. The regulations regarding heating, drinking water, washing facilities, sanitary accommodation and the cleanliness of factories are each considered briefly.

Chapter IV deals with industrial poisonings and their effects, the substances discussed being lead in its various forms, arsenic, mercury, brass, copper, zinc, manganese and nickel. Part 2 deals with the effects of gaseous fumes, etc. (for example, arsine, carbon monoxid, illuminating gas, carbon dioxide, hydrogen sulphide, sulphur dioxide, chlorine,

nitric oxide, ammonia, carbon bisulphide, coal tar derivatives and phosphorus). Under each of these headings the symptoms of poisoning, preventive measures and treatment of those poisoned are considered in detail. There are numerous photographs of smoke helmets, gas masks, respirators, pulmotors and the like, in use in industrial plants.

Chapter V is "Dust as a cause of disease." The standards of dust content of the air and the apparatus for estimating this amount are described. Pathological conditions produced by dust are discussed in detail, the chapter being illustrated with a number of charts and photographs. The various trades in which dust is a factor of danger are considered in turn. Chapter VI is on "Industrial infections," about a third of the chapter being devoted to industrial tuberculosis. The other diseases considered are pneumonia, influenza and other respiratory infections, anthrax, glanders, mycotic infections and hookworm. Chapter VII deals with occupational affections of the skin and special senses and occupational cancer. The agents producing these affections may be divided into physical agencies, most important of which is the sunlight with its production of the weathered appearance of the skin; second, chemical irritants and caustics such as acids and alkalies; third, metallic agents causing dermatitis and ulceration, such as chromium, nitrate of mercury, etc.; fourth, the mineral oils and tars with their production of oil dermatitis; fifth, other hydro-carbon derivatives, such as T. N. T. and the aniline dyestuffs; sixth, vegetable substances, for example, box wood. Section 2 is concerned with "Cancer and occupation," for example, the bladder tumors in aniline dye workers. Section 3 is "Occupational affections of the special senses," including "accidents and diseases: (*a*) of the eye, and (*b*) of the ear."

Chapter VIII, which covers nearly 150 pages, is devoted to miscellaneous occupations in relation to health, mining, iron and steel, glass, chemical industry, textile industry, seafaring and the effects of air modification. The chapter is divided into a number of subheadings each dealing with a particular trade—for example, mining, chemical works, etc.—and the dangers to which that trade is subjected are discussed at length.

Chapter IX is "Industrial physiology (termed by Lee the 'newest of sciences') fatigue, occupational nervous diseases." The subjects are the rôle of fatigue in the production of accidents and inferior work, hours of labor, rest intervals, overtime, etc. Chapter X, "Industrial Welfare," deals with the medical supervision, first aid, canteens, clothing, etc. Chapter XI covers accidents, electric shock and injuries, and workmen's compensation. The chapter is a very satisfactory one, and the many procedures in vogue for the purpose of preventing accidents are considered. The section on Workmen's Compensation deals with the application of the law in Great Britain.

There are two important appendices, the first being the "Epitome of British legislation affecting industrial hygiene," and the second being a statement of the "duties of local authorities under the factory and workshop acts of 1901 and 1907." The book is a valuable and complete study of the subject of industrial hygiene and combines with this a brief but satisfactory consideration of industrial medicine. The work will appeal to those who are concerned with this new and important field of medical science.

EDGAR ERSKINE HUME.

ORDERS, DECORATIONS AND INSIGNIA, MILITARY AND CIVIL, with the History and Romance of their Origin and a Full Description of Each, by Colonel Robert E. Wyllie, General Staff, U. S. A. With 367 illustrations (over 200 in color). G. P. Putnam's Sons, New York and London, The Knickerbocker Press. 8°, 269 pp., 1921. Price, $9.00.

Colonel Wyllie's book is the first American text on the subject of orders and decorations, a subject which has proved of general interest to those in the military and naval services since the beginning of the World War. The work is introduced by a chapter on the "History and Development of Medals and Decorations" showing that our modern

system dates from the time of Queen Elizabeth who in 1588 caused to be struck a medal known as "The Ark in Flood," because this design appears on the reverse of the medal. As it appeared in the year of the destruction of the Spanish Armada, it is not unreasonable to suppose that it commemorated that event, although we are without definite information on this point. The average reader will be surprised to learn that the first decoration in history which had a general application to enlisted men (those of earlier wars were confined entirely to commanding officers) was that issued in 1782 by General Washington, who in a general order instituted a purple heart of silk or cloth which could be worn upon the uniform of those soldiers who had performed acts of singular merit such as unusual gallantry or extraordinary fidelity. The records of these awards were kept in the Book of Merit.

Chapter II contains general information regarding military orders. Chapter III is concerned with nomenclature, classification and the method of wearing decorations and medals in our own and foreign services. Chapter IV deals with American decorations, the Medals of Honor of the Army and Navy, the Distinguished Service Medals of those services, the Distinguished Service Cross of the Army, the Navy Cross, the Certificate of Merit, the Citation Star, and the Treasury Department gold and silver Life-saving Medals. Chapter V considers in turn the American Service medals and badges beginning with the Dewey Medal approved by Act of Congress June 3, 1898, being the first American service medal and ending with the Victory Medal with its clasps, the most recent American service medal. Chapter VI comprises the decorations of Great Britain, and as nearly all of the principles in vogue in foreign countries in regard to decorations are well illustrated by the British system, this chapter considers in great detail the whole system of awards. The British, like ourselves, place their highest valor decoration ahead of all other awards, while other countries consider that the orders such as are awarded to commanding officers of the military and naval services should have precedence. Like ourselves, the British have certain decorations awarded to those in any of the services, and others which are particularly awarded to military, naval or air force personnel. Chapter VII deals with the decorations or the orders of France, Belgium and Monaco and is particularly interesting to Americans, since more Americans received French decorations than those of any of our allies. The history of the Legion of Honor is given in detail and also the French Colonial Orders and other awards. The Belgian awards are briefly considered, and there is a note regarding the Order of St. Charles of Monaco which was awarded by the Prince of that country to a number of Americans.

Chapter VIII deals with the decorations of Portugal and Italy, in each of which countries there are certain rules differing from those prevailing elsewhere in Europe. Chapter XI discusses the orders of Eastern Europe, beginning with Russia, in which certain of the old imperial orders were continued by the Kolchak government. At the time of the publication of the book no Polish orders had been created for World War service. The awards made by Czecho-Slovakia, Roumania, Serbia, Montenegro and Greece to Americans are discussed.

Chapter X deals with the Japanese orders and those of the Republic of China, with a note as to the orders of Cuba, Panama and the old kingdom of Hawaii (which had awarded the Order of Kamehameha to certain of our naval officers in the old days). Chapter XI considers the decorations of the colors, and Chapter XII the shoulder insignia as used in the World War. Chapters XIII and XIV are a history of the insignia of rank and arm of service with an interesting account of the numerous changes which have taken place in the regulations regarding the uniform.

The book is most interesting and the only one on American decorations that can be had. It is profusely illustrated with photographs and colored plates. The subject matter is complete and on the whole accurate. There are, however, certain errors and

omissions; for example, in the section of Roumania, the Order of Regina Maria is entirely omitted, although this order was in existence at the time the book was written. The Montenegrin Obilitch Medal, which has been most rarely awarded, one of the few recipients being General Pershing, is stated (page 184) to be suspended from a red ribbon. This is incorrect, as the ribbon is three equal stripes of red, blue and white. The author has probably confused this medal with the Serbian Obilitch Medal, which is suspended from a red ribbon. The ribbon of the Order of Michel the Brave of Roumania is described purple with gray edges. The edges actually are of silver metal. Similarly the ribbon of the Order of the Crown of Roumania is not merely blue with a white stripe at each edge, as stated on page 177, but blue with metallic silver edges.

It is hoped that the second edition of the work will be forthcoming in order that certain awards which have been created since the book appeared may be included; for example, the three Polish orders, Virtuti Militari mentioned on page 171 as a former order, the Order of the White Eagle, and the Order of Restored Poland. Italy has, since the war, struck a medal to accompany the War Service Ribbon, mentioned on page 162 as having been awarded to United States troops serving in Italy, and in addition the Medal for Italian Unity, created by King Humbert, was awarded to all those who served in the World War with Italian troops. The author, while showing that the Victory Medal awarded by all of the allied powers (all using the double rainbow ribbon but varying the medal design slightly) went to every soldier who served the allied cause, does not show that each of the countries, with the sole exception of the United States, had an additional ribbon and medal to indicate service in its own army. Thus, America alone has no medal of its own for those who served in the theater of operations in the World War. A man in our uniform might wear the Victory Ribbon and yet never have served under the American flag until today and no one could tell from his ribbon that his service was any different from that of an American who served in France in the Army and did not render service which entitled him to one of our battle clasps.

In a work less carefully written and less complete than Colonel Wyllie's, one would not notice the several minor omissions and errors before noted.

EDGAR ERSKINE HUME.

SPECTACLES AND EYEGLASSES: Their Forms Mounting and Proper Adjustment, by R. J. Phillips, M.D.; Ophthalmologist Presbyterian Orphanage, Late Adjunct Professor of Diseases of The Eye, Philadelphia Polyclinic and College for Graduates in Medicine, etc. Fifth edition, revised; with 61 illustrations. Price, $1.50. Philadelphia: P. Blakiston's Son & Co.

In his preface to the first edition the author says the book "is intended to supplement studies in refraction, and to give the student that knowledge of the correct placing of the glasses before the eyes without which the most painstaking measurement of the refraction will frequently fail of practical results. With the popularization, as one may call it, of ophthalmology in the profession, many physicians who prescribe glasses are compelled, by the lack of skilled opticians in their neighborhood, to themselves furnish the spectacles to the patient. To these, it is believed, the knowledge which I have endeavored to impart in these pages will prove especially useful."

There are few communities at present beyond easy access to the optician and few oculists can devote time to the mechanical fitting of spectacle frames, a vocation essentially different from the art of refraction and disease of the eye.

On the other hand, a general knowledge of the subject is necessary to the proper checking of the optician's work, and to this end this little manual will prove of service to the busy eye man or the beginner and student of refraction.

That the optician's trade is quite apart from the work of the oculist is evident, and the less the one encroaches on the other the better in spite of the laws allowing "Optometrists" and the too frequent practice of the oculist dealing in spectacles, a practice to be condemned where it is possible to do otherwise. We should rigidly set our faces against any union of the two.

T. E. Oertel.

Manuel De Neurologie Oculaire. Deuxieme Edition, by F. De Lapersonne, Clinical Professor of Ophthalmologie, and A. Cantonnet, Ophthalmologist at l'Hopital Cochin. Publishers: Masson and Cie., Paris. 416 pages, 113 figures and 4 colored plates.

The book is divided into two major parts, the first part considering in detail the nervous apparatus of the eye, the symptomatology of lesions of them, and the classifications of these symptoms. Part 2 discusses in detail the nervous ocular troubles in the diverse diseases of the eye.

Part 1 is subdivided into several sections. The first considers in detail the anatomy and physiology of the oculomotor apparatus, the clinical examination of the normal and the abnormal with the symptomatology of such conditions as ptosis, blepharospasm, diplopias, nystagmus, and all the various paralyses and types of strabismus in accurate and careful detail. The paralyses of the intrinsic motor nerves are as carefully considered. Such conditions as mydriasis, myosis, the Argyll-Robertson pupil, etc., are all included in this. A large portion of one chapter is given over to external manifestations of the diseases various intercranial nuclei.

The second subsection of Part 1 considers the nervous apparatus of vision in the same manner as the intrinsic and extrinsic oculomotor apparatus is discussed in the first subsection, i.e., the anatomy and physiology, the clinical examination, symptomatology (a very good section of disturbances of the visual fields), and the classification and the relationships of the symptomatology of the various diseases themselves.

The third subsection of Part 2 discusses the ocular apparatus of sensation; the neuralgias, herpes, the neuroparalytic keratitides, etc.

The fourth subsection of Part 1 considers in detail the oculo-vasomotor and secretory apparatus including ocular tension and the hyposecretion and hypersecretion of the tears.

Part 2 of the book itself correlates all of the normal with the abnormal in the various pathological eye conditions as well as the general pathological conditions of the body, as those of the face, the sinuses, of the teeth, and the general systemic conditions of the nervous system. This last includes meningitis of all varieties, thrombophlebitis, cerebral hemorrhage, brain tumors and other allied conditions. Diseases of the cerebellopontine angle, the bulb, the medulla and the spinal cord; conditions as chorea, acromegaly, paralysis agitans, hysteria, epilepsy, exophthalmic goiter, etc., are all carefully discussed.

In addition to these diseases mentioned, which are all very closely related to the oculomotor and oculosensory systems, the authors have also considered the oculopathological side of diseases of the gastrointestinal and respiratory tracts, the diseases of the blood as the anemias and hypertension, and the diseases of the genito-renal-urinary tracts, the dyscrasias, autointoxication, drug and alcohol intoxications, and the relationship of the eye to the infectious diseases.

The entire book is well illustrated by drawings, plates, charts, photographs of cases, pathological specimens and case reports. The personal experiences of the authors are carried throughout the entire text, illustrating and clearing up from an anatomical and pathological standpoint many conditions which have been purely theoretical up to now in so far as a book upon the nervous apparatus of the eye is concerned.

The index is complete and lends well to rapid reference and cross references.

Edmund B. Spaeth.

207

THE MILITARY SURGEON

VOL. 53 SEPTEMBER, 1923 NUMBER 3

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE DEVELOPMENT OF AVIATION MEDICINE[1]

BY LIEUT. COLONEL W. R. DAVIS

Medical Corps, United States Army

WE ARE so accustomed today to seeing the bird men soaring above us, and to learn of the remarkable feats performed, and aviation in general has become so common throughout the world that we are apt to forget its recent origin. This applies not only to military aviation, but we often fail to grasp the commercial advances and possibilities. The novelty of the game has passed to a certain extent, and when we learn of the wonderful practical work done, not only in the military establishment, but commercially in the transportation of passengers, mail, freight, etc., we wonder what the next few years will bring forth.

It is believed that it will be of interest to review man's effort to utilize the air as a means of transportation and some of the difficulties encountered by him previous to the Air Service becoming a combatant force. We of the Army Medical Corps are especially interested, as in order to render the most efficient service we must be familiar, more or less, with all army development and methods of combat.

For ages man has envied the birds and desired to emulate their flight. His dreams of aviation have been handed down to us in mythology, and airships of curious design have been painted by artists of many periods. Since the days of Nero various men have attempted flights by means of artificial wings which were either to be flapped or used as gliders.

In 1694 a French missionary stated that the Chinese had sent up a balloon in 1306. The first balloon of which there is authentic record, however, was invented in 1772 by the Montgolfier brothers and consisted of a paper bag filled with hot air. Larger Mont-

[1] Read at Annual Meeting, Association of Military Surgeons, October, 1922, Washington, D. C.

golfiers, of substantial material, were made later, and in 1783 De Rozier and the Marquis d'Arlendes made the first balloon flight ever taken by man. The same year Charles constructed the first hydrogen balloon.

The inventions of the Montgolfiers and Charles stimulated interest in ballooning. Many advances were made in the construction of balloons, and in 1794 the French used observation balloons in the battle of Fleurus. The French again used them in Africa in 1830 and in Italy in 1862, and they were used extensively during the Siege of Paris in 1870. In our own country balloons were first used for military purposes by the Army of the Potomac.

Ballooning, however, did not fulfill man's ideas of flying, and efforts were continued to construct a machine which would enable him to fly without the use of gas bags. Among the names of the pioneers in aviation may be mentioned Sir Hiram Maxim, Pilcher, Chanute and Herring, Lilienthal, Langley, the Wright brothers, Santos Dumont, De la Grange, Farman and others.

The first heavier-than-air flying machine was developed by Prof. Langley in 1894, and made its first flight on May 6 of that year. The model was small, not big enough to carry a passenger, but the Government requested him to adapt his principles to a large machine for use in war, and on October 7, 1903, after several years study of the problems involved, the first man-carrying machine was launched by him from a houseboat on the Potomac River, 30 miles from Washington; it was caught by the falling ways and fell into the river. A second attempt was subsequently made, but it was unsuccessful from the same cause. After Prof. Langley's death, however, this machine was taken to Hammondsport, New York, and equipped with pontoons, and on May 28, 1914, made a successful flight.

The first successful heavier-than-air *machines* were developed by the Wright brothers, who began a series of experiments with gliders at Kitty Hawk, N. C., in 1900, and on December 17, 1903, Wilbur Wright made the first successful flight in a motor-driven heavier-than-air machine. In 1907 the Wright brothers offered to sell their rights and interests to the U. S. Government, but the offer was declined. On December 23, 1907, the War Department issued the first specification for an aeroplane and two contracts were awarded, that of the Wrights being dated February 23, 1908. Congress refused to appropriate money for this work and the Board of Ordnance and Fortifications supplied the funds. On September

9, 1908, Orville Wright made the official test at Fort Myer, Va., of the aeroplane which the Wright brothers had constructed. It was a complete success.

The tests were continued, but on September 17 his machine crashed, killing Lieutenant Selfridge and injuring Mr. Wright. Selfridge Field is named for the first American military aviator who was killed in an aeroplane crash. Another plane was constructed by the Wrights and delivered at Fort Myer in 1909, where it was accepted by the Government. It was the first aeroplane to be owned by any government, and with it the first steps in teaching army aviators to fly were taken. Half a dozen officers received flying instruction in 1909 and 1910, but no appropriation had been made by Congress for this work, and it practically ceased in 1910. On March 3, 1911, an appropriation of $125,000 was made for the development of an air service, and in June of that year a flying school was established at College Park, Md. This station was abandoned in 1913, and personnel and machines moved to Texas City, Tex.

The first aero squadron was organized at San Diego, Calif., in September, 1914, with a strength of 16 officers, 77 men, and 8 planes. Two aeroplanes were used by us in military maneuvers in August, 1912. The same year 90 French aeroplanes participated in a military review in France. Our history of aviation covers only a period of ten years; from 2 planes in 1912 to our present activities.

Prior to the war Congress seemed very reluctant to give large appropriations for the development of an air service. The appropriation for 1913 was $100,000, and for 1915, $250,000, while France appropriated $7,000,000 for the same purpose in 1914 alone. From 1908 to August, 1915, the United States acquired 59 aeroplanes, and by the Act of July, 1914, an Aviation Section, Signal Corps, was established with an authorized strength of 60 officers, secured by detail from the other branches, and 250 enlisted men.

On May 28, 1918, the President, by executive order, established the Division of Military Aeronautics for the duration of the war, thus separating the Air Service from the Signal Corps, and at the same time creating the Bureau of Aircraft Production. The Air Service was definitely established as a separate organization by the Act of June 4, 1920, which gave it a strength of 1,514 officers and 16,000 men.

During the war the Air Service, as other branches of the Army,

expanded to enormous proportions. At the time of the armistice it consisted of 125,555 men and 18,089 officers, of which over 10,000 were flyers. During the war our allies furnished 3,800 planes for use in Europe, while we constructed 8,000 training planes and 3,227 service planes, of which 1,885 were sent abroad.

The entire medical profession has read with much interest the pioneer work done by Schneider and others in altitude work conducted on Pike's Peak, the remarkable cardio-vascular, psychic, respiratory, and blood chemistry changes recorded, this at an altitude of less than 14,000 feet. With these startling truths given us at this altitude, how much more confronts us in observation of pilots going to three times this altitude and from an atmosphere delivering 21 per cent oxygen to 6 per cent or even less.

With the establishment of military aviation, its permanency and rapid increase being evident, military men realized that it did not follow that men who were physically fitted for ordinary military service were necessarily fitted for duty as aeroplane pilots. The medical profession in general began to awaken to the fact that a new and unexplored field was being opened. Previous to the establishment of aviation, medical men had been concerned with human beings who had their feet planted on terra firma, either at sea level, short distances beneath the surface of the earth or at altitudes at which only slight physiological changes were encountered.

Research work relative to altitude had been carried on only among certain individuals engaged in climbing mountains—slow, laborious ascent, which allowed gradual physical changes to develop. With aviation we were confronted with a problem of a human being rapidly ascending to heights farther above the sea level than had ever before been explored by man, ascending under peculiar conditions which brought forth certain physical and mental strain that could not be experienced by any other method of ascent.

As early as 1912, special physical examinations of applicants for aviation duty were prescribed in our army. In July, 1914, blank forms and instructions governing the scope and method of conducting the examination were issued, and units were established for the examination of applicants for flying training and flying ratings.

With the expansion of the Air Service coincident with our entry into the World War, it became necessary to form the Air Medical Service to take care of the medical problems peculiar to

aviation, and on September 6, 1917, a Chief Surgeon of the Aviation Section of the Signal Corps was detailed. During the fall of the same year 67 examining units were established in the principal cities of the United States for the purpose of examining applicants for flying training. These units operated until a sufficient number of applicants had been accepted. They examined 45,403 men of whom 24,303 were found physically qualified for flying training. Of these men 17,690 started flying training, and to December 31, 1918, 11,831 qualified as Reserve Military Aviators. During 1919, 1,670 others completed their flying training.

When we entered the war the knowledge which our allies had gained by experience was placed at our disposal, and medical officers interested in the development of our Air Service were sent to England, France and Italy. Our methods for examining flyers and our plans for caring for them at home and abroad were submitted to the experts of the British, French and Italian forces, and the same statement was reiterated by them all: "It is very fortunate that the air forces of the United States are profiting by the mistakes of our flying service in recognizing at the beginning that the *medical problem of aviation is a very special problem* and cannot possibly be conducted *except by an organized body of experts.*"

In August, 1917, detailed information was obtained by our Air Service from the Royal Flying Corps, giving data upon the marked nerve instability that developed in flyers fighting on the front, and the effect of this instability in reducing the efficiency of the flying forces. This led to a study of the *effects of altitude on man* and *its relation* to those deteriorations of *mental* and *physical* activity, which were evident factors in causing marked reduction of fighting power of the various flying squadrons on the front. The general study of altitude effects, together with a study of these reports, led to the suggestion of the establishment of a special board to investigate these effects and, if possible, institution of means for overcoming them. A recommendation was accordingly made and a Medical Research Board was appointed September 26, 1917, for the following purposes:

1. To investigate all conditions which affect the physical efficiency of pilots.

2. To institute and carry out at flying schools, or elsewhere, such experiments and tests as will determine the ability of pilots to fly in high altitudes.

3. To carry out experiments and tests at flying schools, or elsewhere, with a view to obtaining suitable apparatus for the supplying of oxygen to pilots at high altitudes.

4. To act as a standing medical board for the consideration of all matters relating to the physical fitness of the pilots.

This was approved by the War Department and the original Medical Research Board was detailed on October 18, 1917. The work begun by this board has been continued by the Medical Research Laboratory and School for Flight Surgeons, at Mitchel Field, Long Island.

The organization of the Medical Department of the Army Air Service is at present practically the same as in 1917, and consists of the Chief of the Medical Section of the Air Service, the Medical Research Laboratory and School for Flight Surgeons, at which flight surgeons receive the necessary instruction in their *specialty,* and flight surgeons, who are the medical specialists on duty with Air Service troops.

The question is often asked: Why is it necessary to have medical specialists in aviation and medical officer on duty in the Office of the Chief of Air Service? It is answered by an explanation of the physical requirements of the aviator, the dangers and difficulties to which he is exposed, and the physical disabilities to which he is especially liable as a result of exposure to low oxygen tensions and trying situations, showing cardio-vascular, psychic and other changes as no other activities cause.

The airplane pilot not only operates in an element which is unnatural to, and has heretofore been inaccessible to man, but he finds himself in control of a high powered, complex, delicate machine, the management of which taxes the faculties of one who is in every respect normal physically and mentally, and the operation of which requires his absolute and undivided attention. A physical defect which for other branches is unimportant, or failure to respond to his bodily demands for an increased oxygen supply, may be the cause of disaster to himself, his passenger, and the innocent bystander. The man who drives an automobile may make a mistake twice, but for the pilot his first error in judgment is only too often his last.

The medical problems of aviation consist of:

1. The selection of the flyer.
2. The care of the flyer, which includes (*a*) the classification of

the pilot according to altitude at which he may fly, and (*b*) the maintenance of his efficiency in actual service.

The selection of the flyer calls for special examinations which medical officers cannot make without special training.

The classification of the flyer calls for a highly complex examination and the use of apparatus with which the *medical* officer, unless especially trained, is wholly unfamiliar.

The care of the flyer calls for a knowledge of certain phases of a group of subjects collectively known as aviation medicine. This knowledge is only acquired by special training.

Why is all this essential? Why does the flyer need more careful selection and care than the ordinary officer or soldier?

First, let us consider the selection of the flyer. When a man leaves the ground he finds himself in a new environment. He finds that he demands certain physical powers that he never called into play before. He finds that his adjustment to ground work no longer meets his requirements and he endeavors to adjust himself to a new environment.

The non-flyer is concerned with straight ahead vision—that is, practically all his vision is concerned with the central part of the retina. If his vision be defective he can correct it with glasses. If he has central color vision it is all that is important. So far as the muscles controlling the movements of his eyes are concerned, they are of little importance unless he has an actual squint, which is easily determined by anyone.

The aviator, however, must have excellent vision and cannot wear glasses. He is concerned with peripheral vision as well as central vision both for form and color. For example, when looking straight ahead, he must be able to detect the presence of a plane off at one side. Should he have a defect in his visual fields, or a blind spot, as we call it, it might easily obliterate the image of that plane and, in war time, easily cause his death if the plane were a hostile one. The aviator must literally see on all sides at once. We must, therefore, test both central and peripheral vision. It is only rarely that those in the ordinary pursuits of life are called upon to turn their eyes to the extreme angle. Turning the head is all that is necessary. The aviator, however, turns his head as far as possible and then turns his eyes, and this he is doing constantly. This brings into play his ocular muscles. These muscles act in opposing groups and work together. If they are not properly balanced in strength, one overpowers another and double vision

occurs—a serious matter. Very few people have absolutely normal muscle balance, but most of us have a compensating power that prevents double vision. In some, however, the tendency of the eyes to deviate is so great that under strain, fatigue, effects of altitude, etc., the weak muscles give way and double vision results. It is possible for the subject to suppress one image and the inexperienced may suppress the wrong one. The tendencies and strength of the ocular muscles must then be determined. This calls for a test, to give which one needs special training. On the original examination, the eyes must be refracted in order to determine whether or not the latent refractive error is present. Oftentimes such a condition exists and it, in itself, causes, as well as increases, muscle defects. Further, latent errors become manifest and cause trouble later. The vision might decrease after completion of training, and the time and money thus spent would be lost. The examiner must, therefore, be able to refract. Accommodation is important, as the flyer is constantly changing his focus from far to near and back again. This then must be tested.

One of the most important things for a flyer is ability to judge distance. He must be able to judge accurately his distance from the ground in making a landing, also his distance from buildings, trees, and other planes.

It will be seen, then, that examining a flyer's eyes means a great deal more than testing his vision by means of a wall chart. While it does not call for a skilled ophthalmologist, it calls for a knowledge of ophthalmology that the ordinary medical officer does not possess or need.

The tests for hearing and for examination of the nose and throat do not call for any very special knowledge. The standards are higher, however. The changes of atmospheric conditions, such as temperature, pressure, wind blasts, etc., affect the mucous membranes, and there must be a clear passage so that no interference with breathing will ensue. The Eustachian tubes must be patent, as the constant changes of pressure will cause retraction or even rupture of an ear drum. The ear drums must be healthy and not scarred.

The question of equilibrium is very important and must be understood by the examining officer. There are several factors taking part in equilibrium, and various tests and apparatus are necessary. The best known is the test of the vestibular apparatus

by the Barany chair. Special training and knowledge are necessary for the proper interpretation of the results.

The general physical examination differs little from the ordinary recruiting examination. Special attention is paid to the heart. Flight surgeons are given intensive training in cardiology.

Lastly, and probably the most important of all and most interesting, comes the examination of the nervous system. The flyer is subjected to unusual and cumulative stresses, capable of disturbing the stability of any nervous organization. His selection is a strictly individual and highly specialized problem. Not only must there be a thorough neurological study but close scrutiny also of the entire mental life with a view to determining trends, resistances and potentialities, and in view of these latter, the probable reactions to the experiences inseparable from his daily work. Both during training and subsequently, the medical officer charged with the care of the flyer must vigilantly watch for the detection of those early and insidious departures from the normal significant for the psychoneuroses and which unfit the flyer, temporarily or permanently, for flying. This is in order that highly specialized personnel may be conserved and the service protected against needless waste and loss. The training ordinarily received by the medical officer does not fit him for the discharge of these duties. His information along these lines is too general. Special training in neuro-psychiatry is necessary. It is evident, therefore, that a special examination is necessary to select flyers, and that medical officers without special training and experience cannot make this examination.

After we have our flyer selected we must classify him according to his ability to withstand the effects of altitude. At high altitudes there is a deficiency of oxygen, and different individuals adapt themselves to this shortage in different ways. We have an altitude classification test by means of which we can determine an individual's reaction to the effects of altitude—in aviation parlance "Get a man's ceiling." The test involves a complex apparatus and a knowledge of aviation physiology and psychology. It takes considerable training and experience with the test in order to perform it satisfactorily. One can fly safely at 8,000 feet, another at 20,000 feet, etc.

After selecting and classifying a flyer, equally important work remains to be done. This comes under the heading of care of the flyer.

There is a severe strain, mental and physical, associated with flying. The effects of fatigue, the production, symptoms and treatment of staleness are all important. The flyer begins to make poor landings and shows poor depth perception. Minor conditions which are of no great importance to the ground officer make it dangerous for an officer to fly. For example, minor or pathological conditions, fatigue, anxieties, early departures from the normal nervous makeup as already cited under selection of the flyer. The flight surgeon must have some practical knowledge of flying, he must be familiar with these problems, and from this knowledge pass on the physical fitness to fly of each individual from day to day.

Just as it is the duty of the Medical Department to keep troops at the front and restore the disabled to the fighting line as soon as possible, it is the duty of the flight surgeon to keep flyers in condition to fly and restore those temporarily grounded to a flying status as soon as possible. Briefly, a flight surgeon must have a knowledge of the physical factors concerned in flying, the responses, and adaptations of the body to these factors; he must know his flyers individually, must himself make frequent flights as pilot or passenger, and as a result of this knowledge he can advise his commanding officer relative to his flyers and prevent accidents.

The maintenance of the efficiency of the flyer in actual service is entrusted to the flight surgeon with the aviation troops. Under the provisions of Section 4, G. O. 8, W. D., 1921:

> The flight surgeon acts as adviser to his commanding officer on all matters pertaining to the physical fitness of the flying personnel; he makes recommendation for the relief from flying duty of officers or enlisted men who are found physically or mentally unfit for such duty and makes such recommendations as he deems proper based upon his special knowledge as to the care of the flyer, physical exercise, recreation and periods of rest; he takes sick call for the flying personnel and recommends disposition of the cases excused from flying duty; he will visit such flying personnel as may be sick in the hospital and consult with the attending medical officer regarding their care and treatment. . . . He is given every facility for performing his special duties and for acquiring additional information relative to the medical problems of flying. He lives in as close touch with the flying personnel at his station as is consistent with conditions existing thereat.

In order to perform efficiently the duties required of him he must have a thorough knowledge of the diseases to which the aviator is especially liable, and be able to detect them in their incipiency and

while they are remediable. He should also be able to appreciate the pilot's anxieties, the difficulties which he must overcome, and the dangers to which he is exposed.

The fight surgeons are specialists who have been trained for duty with, and whose work is exclusively with Air Service troops. Having been specially selected and trained for this class of medical Department work, it is believed that it has been found that it is to the best interest of the service that his activities should not be diverted therefrom.

The immense value of the flight surgeon to the Air Service can be realized when our accident statistics are compared with those of our allies during the first years of the war and before they began to pay sufficient attention to the selection and care of their flyers. The British at the end of the first year of the war found that of the total number of accidents to their flyers, 65 per cent (this very conservative, many estimate 90 per cent) were due to physical defects of their pilots. They at once realized the need of expert medical study of their flyers. The next year the percentage was 20 per cent, and the next, 12 per cent. Of the crashes reported in the United States from April 6, 1917, to January 1, 1920, 2 per cent were due to the physical condition of the pilot, as follows: vertigo, .96 per cent; acute physical impairment, .80 per cent; chronic physical impairment, .24 per cent.

Some of the credit for this reduction in accidents is due to better methods of training, but much also to the flight surgeon. During 1920 there were 3,500 physical examinations for flying made. Of these 803 were absolutely rejected. During 1921 there were 2,833 examinations and 442 absolute rejections. Of these 1,245 rejections, 1,093 had passed the regular army physical examination. Statistics show that only about 60 per cent of civilians are qualified to fly and about 75 per cent of those that have passed the army recruiting examination. A number of those qualified in 1920 and 1921 were qualified by means of waivers. The flight surgeon, with his knowledge of aviation medicine and of the individual flyer, can recommend which cases can safely be waived.

The wisdom of our methods of dealing with the problem seems proven by the results obtained, and if the saving in lives and property were estimated in dollars and cents the sum would be enormous.

AVIATION AS A MEDICAL PROBLEM

By Lieut. JAMES D. BENJAMIN, M.C., U. S. Navy
Flight Surgeon, U. S. S. "Langley"

EVERY great undertaking has its medical problems. The Panama Canal was made possible due to medical science. Without the work of Gorgas and his confreres the work would never have been finished. France failed to build a canal because she was unable to successfully cope with the sanitary problem involved. The World War was won due in a great share to medical science, so now the newest venture of man, aviation, must solve its medical problems, before it can become a complete success.

The average person who has seen planes in the air and read of spectacular feats performed by aviators and the great progress that has been made in aviation in the last ten years, has, undoubtedly, hardly given a thought to the fact that medicine has aided aviation in the past and has unlimited possibilities for help in the future with the exception of the fact that, of course, the doctor is the man wanted for first aid in the event of a crash. But as prevention of disease is now the new cry and thought of the public as well as the medical profession, so is prevention of crashes and accidents the new thought of medical men in touch with aviation. This line of thought has given rise to a new kind of specialist in medicine—the flight surgeon.

To the lay person the term "Flight Surgeon" would probably only mean a surgeon who flies to an accident and renders first aid in saving life. But that is the merest detail in the work of a flight surgeon. The flight surgeon's work begins before the crash occurs. He endeavors to isolate possible causes that might bring on a crash and eliminate those causes and so prevent the crash from occurring.

The medical problems of aviation are many. Early in the World War medical authorities began to realize this fact and so firmly convinced the War Department that a special school was organized to take up the study of aviation medicine and to train medical officers for duty with aviation units. Thus the flight surgeon came into being, and the school that trained him was called the Medical Research Laboratory and School for Flight Surgeons, the name of which has since been changed to the School of Aviation Medicine. This school is distinctive in type, as there probably exist few

schools like it in the world at least doing similar work. It is located at Mitchel Field, Long Island, New York. This is a happy location, for this is an active flying field; in fact, one might say the Atlantic terminus of all air lines. Nearby are other flying fields and the terminus of the Postal Air Service, as well as the Curtiss Airplane factory. For clinical facilities there are the great medical centers of Brooklyn and New York.

Thus, for a school to study aviation medicine, a better or more suitable place could hardly be found. The course is divided into six branches, viz.: Aviation Medicine, Physiology, Psychology, Psychiatry, Eye and Ear, and a sixth subject which includes the paper work, technical subjects and any other subject not covered under the five other large headings. Each course is headed by an army medical officer except the subject of physiology, which is held by a college professor who is also a lieutenant colonel in the Officers' Reserve Corps. Every army teacher in the school is a graduate of the school and therefore a qualified flight surgeon, and is thus better able to get the embryo flight surgeon's point of view. Immediately after registration the medical officers in the class step right into the work. The work is literally "thrown at them." First, lectures followed by quizzes, and then, when the future flight surgeon has begun to have a working knowledge of the subject, he starts the laboratory and clinical work. This covers all the tests of vision as to muscular imbalance, colors, refraction, depth perception and near and far vision. It covers work on the ear. It covers physiology, and this is most thorough, taking up all the physiological responses of the aviator's make-up to the stresses of flying and altitude. It takes up the chemical analysis of gas—that is, the analysis of the exhaled air and consequent consumption of oxygen during a run on the rebreather. It takes up the work of the rebreather and the work of the low pressure chamber. The laboratory work also includes X-ray examinations of the heart and chest. Then come lectures and quizzes on medicine, eye, ear, psychiatry and psychology. Spaced in between these quizzes and lectures are clinics in these various subjects at Bellevue Hospital and Brooklyn State Hospital. The prospective flight surgeon must be able to map out the heart by percussion, to diagnose practically any heart condition, to pick up poor mental risks and, as there is keen competition among these medical officers, he has to exert himself to the utmost to keep up with the class. Although the members of the class are given an opportunity to fly as passengers, no actual instruction in flying is given during the course. Some

flight surgeons have, however, taken training at Pensacola and other flying fields and have qualified as pilots.

There is practically no part of the aviator's body that is not affected by the stress of flying. Therefore it becomes necessary that the man about to undergo training for flying shall have nearly perfect physique, for if you start with a poor specimen of humanity or one with some single physical defect, it just becomes a case of the old maxim, "a chain is no stronger than its weakest link." So the man picked for aviation training must be a splendid physical specimen, and he must keep himself in that state. Prior to the advent of close physical examinations in the British Air Force it was found that in every hundred crashes 90 per cent were due to physical defects of pilots, 8 per cent to defects in the planes and 2 per cent to the enemy. After carefully examining their pilots and removing those physically unfit to fly and taking care of those flying, they had only 12 per cent of crashes due to the pilots. There is hardly a reason why this should not be reduced to zero per cent. The French came hard against this problem, for at first they used men for aviation material who were worn out from duty in the trenches and field. Needless to say, such material was bad, and while some wonderful flyers were developed, the principle was wrong and in the main worked out poorly. United States Army figures show, according to a general, that 96 per cent of all army aviation accidents since 1919 were due to the pilots and 4 per cent to defects of the machine. These figures alone warrant more careful selection and care of the flyer.

As previously stated, every part of the aviator's body suffers from the strain of flying. It is hard to get aviators who are seasoned to admit this fact, as they are so used to flying that they do it almost automatically, but the proof is found in the fact that if this same seasoned aviator is a little below par physically, suffering from coryza or overwork or late hours or even a moderate amount of alcohol, it will be shown in his flying, especially his landings, which will be poorly judged, and he will be apt to wreck his landing gear.

The three main physical defects most hazardous in aviation are defects of the mind or tendencies to the same, defects of the ear and eye and defects of the heart. The bare statement that defects of the mind or mental defects are hazardous always brings on the comment that such statement is ridiculous, for a person mentally unbalanced would never be permitted to fly nor would he be able to qualify; but this is not so, for a man may only have a tendency

to become mentally unbalanced and this fact be not apparent until he comes under some unusual circumstance in the stress and strain of flying. High altitude with low oxygen pressure has a similar effect to alcohol, and any tendencies an aviator has to become psychotic are brought out under this low pressure. Several devices have been developed to discover this tendency in an aviator and are used on most flying fields where there are a number of aviators to be examined. The first of these devices is known as a rebreather, one type being brought out by Henderson and another by Larsen. It consists of a large tank containing outside air at sea level pressure in front of which the prospective aviator sits and from which he breathes by means of a rubber mouthpiece. His nose is clipped off to prevent his breathing any outside air. There are intake and outlet valves so that the air always circulates in one direction only. The exhaled air passed through a cartridge of sodium hydrate which removes the CO_2, while the oxygen goes back into the tank and is again breathed by the candidate. Thus he constantly breathes the same air over and over again without the impurities, and at the same time the oxygen percentage is lowered, thus giving the effect of increased altitude. While he is so breathing he performs certain psychological tests—that is, he is given three definite things to perform. First, he must touch a contact button whenever a certain light flashes, and there are fourteen lights in front of him. They do not flash in order but in an irregular fashion. Second, he must operate a foot pedal which changes the speed of a small motor, and third, he must keep a volt meter at a certain voltage.

For these tasks he has the use of his right arm and right leg, his left arm being used to take his pulse and blood pressure. The test is called a run, and throughout the run many data and facts are accumulated, so that the examiner has a very good idea of the prospective candidate's ability when he has finished the run. Four persons besides the candidate are necessary to carry on a run, and they should preferably be medical men—one as clinician who watches the physical condition of the man being examined, one running the machine, one taking blood pressure and pulse, and one as psychologist. Each one gives him a rating, and the lowest rating stands. The test is perfectly harmless and without any immediate or delayed after effects. Each prospective aviator is given a complete physical examination before the run, and if any defect is discovered he is not allowed to take the run. The reaction to the low oxygen varies in different people—some become hilarious,

taking it as a huge joke; others become angry and demolish or attempt to demolish the machine; others become exaggerated in their performance and think they are doing wonderfully when actually their performance is poor; others become drowsy and listless and take no interest in their work. In fact, a run on the rebreather brings out about the same effects as the same man would show after taking a moderate amount of alcohol. From this test we can determine who is to be a stable aviator, who will stand up under conditions, or whether this aviator under examination will "go to pieces" if flying becomes difficult and something goes wrong in the air. It also gives you an idea of the pilot's so-called "ceiling." His ceiling is the height to which an aviator can fly with safety to himself and the plane. This varies under atmospheric conditions, being lower in stormy weather, and also varying with the physical condition of the pilot. It is lower when he is under the influence of alcohol, the amount it is lowered depending on the amount of alcohol imbibed.

To further test the pilot's tendency to break under stress, medical officers who have received special training at Bellevue Hospital and Brooklyn State Hospital observe him. He is questioned as to himself, and his family history is delved into to find possible inherited tendencies. His conduct is observed under as many conditions as possible: in athletics, in amusements, in society, in his living quarters, and even in the air—that is, the flight surgeon actually flies with the aviator to watch his performance in the air. Thus a fairly good idea of a man's mental status is obtained.

Another apparatus is used which often brings out tendencies to mental unbalance, and that is what is known as the "low-pressure chamber." This consists of a steel chamber large enough to comfortably accommodate five or six persons. It is absolutely air-tight and is provided with chairs, table, electric lights and oxygen tubes. The candidate and examiner are placed inside and the door closed air-tight. Through a glass window the operator can watch the people in the chamber. The operator gradually decreases the pressure of oxygen, thus simulating the actual climbing of an airplane. The examiner carefully watches the examinee, who, on any showing of ill effects, is immediately instructed to take oxygen. Here the prospective aviator is taken up to 20,000 feet altitude and down again, and the effect on him is recorded. Thus in another way is the aviator observed and possible poor material discarded.

The average lay person would undoubtedly believe himself phys-

ically fit to fly. But only a small percentage of people are physically fit to become aviators. Army and navy officers are supposed to be selected physical specimens, and there are certain physical requirements that every officer or man entering the service must meet. Also officers must take a physical examination every year. Hence an officer is bound to be a good physical specimen, but it is remarkable to note that a large percentage of officers as well as enlisted men are not able to qualify as aviators. As a test this year all graduating cadets at West Point were given the so-called "609 examination," which is the physical test for flying. The figures have not been published as yet, but it is known that only a very small percentage qualified.

The aviator's eye comes in for careful observation. Not only must he read 20/20, which means a specified line of type at 20 feet distance without glasses, but he must have every muscle of his eye tested separately to see if there is any tendency to strabismus or squinting.

His hearing must be good. A coin click must be heard at 15 feet; a watch tick must be heard at 40 inches, and his internal ear must be in good condition—that is, the semicircular canals, as evidenced by the whirling chair which carries him through the various maneuvers incident to flying.

He must be stable mentally as brought out under observation, certain tests and questioning. So that after a physical examination for flying the flight surgeon has a fairly good idea as to whether or not the man under examination will make a good type for flight training.

Of course the question comes up as to whether there is much more to be worked out and learned in this new branch of medicine. Undoubtedly, as those who have come in contact with this work will tell you, there are unlimited fields for research along this line. The surface has hardly been scratched. For the past fifty years altitude and its effects have interested medical men. Such men as Schneider, Holdane, Henderson and Bainbridge have done and are doing remarkable work along this line. There are others also working quietly at this work, from whom valuable contributions to this subject can be expected. Every fact learned about altitude and its effect is another step in safeguarding the traffic in the air.

CHRONIC INFECTION OF THE TEETH AND GUMS AS A CAUSE OF STALENESS IN AIR SERVICE PILOTS

By Major H. C. NEBLETT
Medical Corps, United States Army

THE PURPOSE of this paper is an attempt to show that chronic apical abscess and chronic periodontoclasia, either separately or combined, are not an unusual cause of staleness in air service pilots. Generally speaking, when symptoms and signs of the above condition are manifested in a flyer, the true cause is not often suspected until later when there may be evidence of an acute dental process present. In the interim the pilot may be temporarily disqualified for flying and kept under observation and treatment for such symptoms as slight headache, dizziness, gastrointestinal disturbances, loss of appetite, fatigability and distaste for flying. On the other hand, the cause is more often attributed to any one of the following factors or to a combination of them, namely, excessive flying, overwork in administrative details with close confinement and lack of exercise, and worry from whatever cause.

Any of the above named agents most probably played a very prominent part in causing neuro-circulatory disturbances in a large number of pilots during the recent war, and shortly thereafter, as the result of very obvious reasons. At the present time, including a year or two past, the causes referred to have been in a great measure eliminated through the mechanical perfection of air service equipment and matériel, through a clearer knowledge of the many essentials upon which the success of the service is based, and by the selection, both mentally and physically, of a class of men best suited for the duties of pilots. These, for the most part, viewed from the standpoint of their past experience and training in the air service, may now be considered seasoned flyers who should ordinarily react a great deal less to the agents mentioned than did the earlier type of pilot.

In the examination and selection of individuals for pilots, mental and physical perfection in them is essential in so far as is possible to be attained. On the whole, those essentials must conform to a definite standard of examination for all flyers. Yet in the qualification of pilots for the air service there is no one thing in their physical makeup which is given as little concern as the

true condition of their teeth. These, for the most part, are of interest in so far as macroscopical evidence points to their general condition of soundness and to the required number necessary for the function of mastication. These having fulfilled requirements at the time of examination and acceptance of the pilot, frequently, they later become diseased, principally due to neglect on the part of the individual through disregard of personal dental hygiene and through lack of a frequent dental survey and treatment. A very broad latitude is therefore allowable relative to general dental requirements and to oral hygiene, with resultant disease of the teeth being frequently manifested. On the other hand, a sinusitis, a deflected septum, diseased tonsils or enlarged turbinates that obstruct the respiratory channels are cause for rejection in an applicant until successfully removed, and in a pilot are a cause for temporary disqualification for the same reason until likewise treated. Again, diseased teeth or gums are rarely given attention by those concerned until the local symptoms become so severe that the dental surgeon is consulted for relief and treatment. During the interim the pilot may show signs and symptoms of staleness, the causative factor having been easily overlooked by the flight surgeon who had the case under observation.

From a study of the causes of neuro-circulatory disturbances in pilots at this post for a period of two years, a great part of which time they were working under unusual stress incident to bombing maneuvers, and test flying by day and night, with the necessary long hours of the air, and in application to administrative details, it was the exception rather than the rule to find a pilot who reacted unfavorably to the stress of circumstances by manifesting the signs and symptoms of neuro-circulatory disturbances as the result of the usual causative agents alone. On the other hand, during the two-year period mentioned, the writer found a relatively large number of flyers whose general symptomatology was indicative of neuro-circulatory disturbances caused by diseased teeth and gums. A brief history is submitted in each case found with the purpose in view of clarifying the points discussed above. The ages in these cases ranged from twenty-four to forty years with an average age of twenty-nine years.

Case 1.—Diagnosis, staleness. For a period of about three weeks did not sleep well, was irritable, slightly depressed and suffered with an occasional dull headache and some loss of appetite with pronounced distaste for flying. Blood pressure and pulse slightly

elevated, exaggerated response of heart to exercise, reflexes and psychomotor tension slightly increased, Schneider index varying between 7 and 9 plus. A fine tremor of tongue and fingers present. The urine showed a faint trace of albumen with an occasional hyaline and fine granular cast. For nearly a year prior to this attack patient had suffered at intervals with pain of neuralgic type in left side of face and left shoulder. Examination of the teeth showed L. 6 to be sensitive and X-ray of which showed an apical abscess. Dental treatment gave prompt relief of all symptoms.

Case 2.—Diagnosis, staleness. Very marked type with a history of a neuropathic taint. This case had persisted for several months, and on account of his general condition during that time he had been disqualified for flying on several examinations. The following symptoms were noted: Breathlessness and exhaustion were constant. The latter was present mentally as well as physically upon slight exertion. Giddiness and headache not of infrequent occurrence. The latter often severely attended with nausea and vomiting. Sleeplessness was marked at times and the patient was irritable and unable to fix attention. Psychomotor tension increased, peripheral circulation relaxed, pulse rate increased, pulse small and easily compressible; blood pressure varied from 102 to 114 systolic, systolic murmur at apex not transmittable; Schneider varied from plus 2 to 7; temperature slightly subnormal to 100°F., and there was an iceteroid tinge of the skin. The leucocyte count was high with a considerable increase in the polynuclear cells. Visual acuity diminished, especially in the right eye with defective accommodation, and horizontal nystagmus bilateral. Loss of weight was gradual and progressive, and the patient was the subject of frequent attacks of acute coryza and bronchitis. Hospitalization was resorted to on several occasions where repeated examination and X-ray of the teeth finally resulted in finding apical abscess involvement of R-1, 2 and 3 with right antrum infection. Treatment of the abscessed teeth and drainage of the antrum resulted in gradual but marked improvement in symptoms with a rapid gain in weight.

Case 3.—Diagnosis, staleness. Infrequent mild attacks of staleness over a period of ten months manifested by slight loss of appetite, occasional slight headaches, mild degree of lassitude and nervousness with a moderate distaste for flying. About three months ago suffered a minor contusion to the left ankle, which was promptly followed by an acute arthritis of the joint. X-ray examination of teeth showed abscess in L-10 and 11. Removal of the cause resulted in prompt relief of the arthritis and improvement in patient's general condition.

Case 4.—Diagnosis, staleness. There was a history of injury in this case involving the lower jaw near the central incisors as the result of an airplane crash. In addition, this pilot had a peridontoclasia of long standing in that area. About a week following the accident the patient developed some pain and tenderness at the site of injury which cleared up in a short time without treat-

ment. About six weeks later developed symptoms of staleness manifested by slight loss of appetite, nervousness and irritability. Patient did not sleep well, was more easily fatigued than usual, and there was lassitude and an indisposition toward doing the usual routine duties. Schneider index averaged plus 4. Pilot was placed in quarters under observation and treatment for a period of a week, during which time he developed pain and tenderness in the area of the incisors of the lower jaw. X-ray showed abscess formation in L-9 and 10 and R-9 and 10. Dental intervention directed to the cause resulted in prompt recovery.

Case 5.—Diagnosis, staleness. Throughout a period of one year this case presented frequent signs and symptoms of acute staleness. These attacks were usually ushered in with an acute coryza or acute bronchial symptoms. Not infrequently these conditions simulated a very distressing type of hay fever, more particularly if the pilot had been exposed to cold and wet or after protracted periods of flying. During three acute attacks of the above condition the pilot developed a very severe furunculosis of the left nostril.

Throughout the course of this case there was very gradual loss of weight, frequent digestive disturbances, a capricious appetite, periods of irritability and restlessness and rather frequent attacks of mild frontal headache. Fatigability was often complained of after moderate exercise. There were no other symptoms or signs demonstrable except a relative low Schneider index which was shown upon several examinations.

The general features in this case simulated pulmonary tuberculosis except that X-ray of the chest was negative, and there was no cough or clinical findings relative to the chest, and no temperature elevation. Finally, some pain and tenderness was felt in the region of L-5 and 6, the X-ray showing an apical abscess in both of these teeth. Prompt treatment of these relieved all symptoms in the case. Three months later patient had gained 15 pounds, with evidence of marked general improvement.

Case 6.—Diagnosis, acute staleness. For a period of two weeks pilot stated he had not slept well, was nervous and irritable, with loss of appetite and an indisposition to fly. During that time he was doing a great deal of flying and believed that his activities in that particular were the cause of his condition. Upon physical examination visual acuity, accommodation and depth perception were below the normal. The heart action was rapid, irritable and irregular with a decidedly poor response to exercise. The pilot was relieved from flying and put under observation and treatment, during which time a series of Schneider indices was made upon him. At the time the case was first seen the Schneider index was plus 7 and gradually declined to a minus 4 over a period of about two weeks. At this time there was local evidence of tooth involvement, the X-ray showing abscess formation in R-11 and 12.

Dental intervention gave a gradual relief of symptoms. The Schneider index a week later was plus 14.

Case 7.—Diagnosis, staleness. Over a rather protracted period of time this pilot had felt generally indisposed and had been treated repeatedly for mild attacks of gastritis, loss of appetite and headaches with giddiness. When examined, his heart action was found to be rapid and irritable with a poor response to exercise. He was pale, nervous and sweating under the axillae and in the palms of the hands. Test exercise showed considerable breathlessness and giddiness. There was a fine tremor of the tongue and fingers and peripheral circulation relaxed.

Dental survey showed a defective crown R-4 with sensitiveness on percussion. X-ray of the tooth showed a large apical abscess. Prompt treatment of the cause resulted in relief of symptoms with a satisfactory convalescence.

Case 8.—Diagnosis, staleness. This pilot had been treated at infrequent intervals for about two months on account of very mild attacks of digestive disturbances with partial loss of appetite and symptoms of general indisposition. Finally, upon a very careful examination he was relieved from flying because of diminished visual acuity, a low Schneider index, abnormal reaction to the Barany chair test, and nervous symptoms with distaste for flying. At the time of this examination a sensitive crowned tooth in the upper right jaw was found. X-ray of this tooth showed abscess formation. Prompt removal of the tooth resulted in a satisfactory convalescence and marked general improvement. This pilot was very fond of athletics, particularly golf, but on account of general lassitude and fatigability following exercise he had given up participating in sports during the above period.

Case 9.—Diagnosis, staleness, acute. Symptoms and signs of staleness in this case were ushered in very abruptly. The pilot had been playing baseball for several weeks, and several days before reporting to the flight surgeon for treatment he had noticed that his vision was very poor, that he was very nervous and had been unable to sleep well for several nights. Examination of the patient showed considerable diminution in visual acuity bilateral, a very low Schneider index, acute nervous symptoms with irritable heart action and a continuous course tremor of the tongue and fingers. These symptoms were followed by loss of appetite, fatigability, lassitude and symptoms of toxic absorption. He was immediately relieved from flying and put under observation and treatment. At the time no local evidence of any tooth involvement could be found. Eight days later he developed a severe aveolar abscess of R-15 and L-15. Under prompt dental treatment directed to the cause, convalescence was quickly established with an early return to the normal.

Conclusion.—The general signs and symptoms in these cases, though somewhat varying in degree, are fairly constant in their presentation, yet their etiological factor may be very easily overlooked without a careful dental survey aided by the X-rays and

blood findings in the case. Especially is this true when the general symptoms are mild, the condition protracted, and when there is little or no evidence pointing to tooth involvement nor history of injury to the aveola processes. Other points of interest in these cases are that the subject is not infrequently a sufferer from attacks of acute coryza, symptoms of hay fever, neuralgic pains about the face or joints, and a tender point in the area of one or more teeth. Especially should old crowned teeth be looked upon with a great deal of suspicion as an etiological factor in these cases. Diminished visual acuity is frequently seen and is sometimes only demonstrable in the eye corresponding to the side with the involved teeth. The various other tests of the eyes may vary from those of the pilot's previous examinations, but they are usually within the prescribed limits. The Schneider index is very striking in these cases, varying from plus 7 or 10 to minus 2 or 3 with a common average of plus 5 or 6. The variation of the index seems to be principally dependent upon the acuteness or cronicity of the tooth infection, the amount of absorption of toxic material from the area involved, and the susceptibility of the individual to the effects of the toxins elaborated. With the elimination of the cause and the incident improvement in the patient the index rapidly rises. This is likewise true of the other features in the case.

In studying the present type of pilot in the light of the points discussed above, and basing one's opinion upon the fact that aviation is now on a peace-time status and that it is a definite vocation chosen by those therein engaged, it seems reasonably feasible that the flight surgeon in the care and treatment of flyers should be thoroughly on the alert for a more definite cause of neuro-circulatory disturbances in a relatively large number of pilots other than that of excessive flying, overwork, or worry which is usually assigned. As has been stated in the beginning of this paper, it is believed to be the exception rather than the rule to find the average experienced pilot who would react unfavorably to the usual conditions of flying, provided that he had no neuropathic history, avoided prolonged intemperance in his habits, and availed himself of a nominal amount of daily exercise.

THE VALUE OF TESTS FOR INTELLIGENCE IN APPLICANTS FOR ENLISTMENT

By Captain WILLIAM C. PORTER
Medical Corps, United States Army

AS EARLY as 1913 articles began to appear in publications of a medico-military nature dealing with the detection of feeble-mindedness and subnormal intelligence in applicants for enlistment in the military services, by means of formal psychometric tests. The work of Schier and McMullin of the Navy attracted special attention. Much work in devising tests for this purpose had already been done by others in civil institutions. But it was not until the advent of the World War that the opportunity was afforded of applying the tests on a comprehensive scale. The work of the Division of Psychology in the Surgeon General's Office, United States Army, is so recent as to be familiar to all members of the service and is exhaustively reviewed elsewhere (1). The results apparently justified the careful psychological examination of large groups of men selected under the draft law. The value of the method as a means of determining, in part, an applicant's fitness for industrial positions in civil life, is being more and more recognized.

To formulate just what is meant by intelligence and what results may be expected by tests for determining intelligence seems proper at this point. It is now probably generally conceded that tests of this character are limited in their usefulness to determining the subject's "native ability," in contradistinction to his "fund of knowledge." By native ability is understood that inherent or constitutional capacity to learn and to adapt oneself to the situation in which one finds oneself. Knowledge is understood to be the fund of information which one acquires by experience after birth. Native ability includes not only the inborn capacity to acquire knowledge but, in its larger sense, the inheritance of tendencies to react in a given manner to emotional stimuli, which tendencies are the result of inheritance, not only from one's immediate forebears, but, in the language of Jelliffe, "from millions of years of ancestors." One must grasp the idea of this multiple and cumulative inheritance in order to appreciate the complexity of emotional tendencies. With this latter factor of native ability, tests for intelligence have little to do directly, although the careful and experienced observer often receives considerable information along

this line from the manner in which the subject performs the psychometric tests.

So the results of psychometric testing cannot be expected to predict with certainty the kind of a soldier a given subject will make. Too many emotional factors enter into the equation. Thus it has been shown by other investigators that offenses against the military law are usually due to inborn constitutional tendencies resulting in ill adaptation to the standards of society, be it civil or military, and that the offense is frequently, if not in the majority of cases, the expression of inferiority in revolt against the rules of conduct or behavior as laid down by organized society. In most cases it is not due to pure intellectual enfeeblement, in the sense of feeblemindedness or moronism, although a certain degree of feeblemindedness may be present. Tests for intelligence (as a part of native ability) can only attempt to predict the capacity of the recruit to learn to perform the duties of a soldier, supposing that he has at least an average of emotional stability.

In 1919 the War Department initiated an intensive campaign for recruits which reached its peak in the fall and winter of 1920, following the enactment of the Reorganization Act of June 20, 1920. The goal was set at 280,000 as the peace-time strength of the Army and every effort was made to bring into the service every available man. The universal industrial depression made the campaign more effective, numbers considered, but that quality was often sacrificed has been evidenced by the results. That many applicants were accepted and enrolled in the stress of the intensive recruiting campaign who would not have been passed by the medical examiners in ordinary peace times is common knowledge in the service and has been taken cognizance of in official publications (2).

The writer was detailed as a recruit medical examiner at one of the principal recruit depots throughout the campaign of 1920 and until the cessation of enlistments in February, 1921. Many methods of estimation of the mental content of applicants were tried and used. The group tests (Alpha and Beta) used during the war were found to be unsuitable, as the groups of applicants available at any one time were too small. The individual tests (Stanford, Binet-Simon, Point Scale, etc.) were too time-consuming, except in certain individual cases. The medical examination was by specialties, each examiner covering one or more portions of the examination by the group method. Thus a very limited time was available for determining the mental status of the individual applicant. The rejections on neuropsychiatric grounds reached large proportions

at certain depots, and at times it seemed expedient to pass some borderline cases who would not have otherwise been passed. It is generally conceded that the material which presented itself or was collected by the earnest and, in some instances, overzealous efforts of individual recruiters was sometimes very poor. The cost of acceptance at distant recruiting stations, of transportation to a depot or camp, and the cost of returning rejected applicants to the place of acceptance doubtless influenced many enlisting officers to pass borderline cases. That many of these subsequently made good, in the opinion of the local commanding officers, seems to justify the action of the enlisting officers in having passed them.

In an attempt to learn something of the after history of those applicants who attracted the particular attention of the medical officers at the place of enlistment, questionnaires were sent to the immediate commanding officers concerned, and this study is now presented showing the results of the psychological tests made at the time of physical examination for enlistment together with the estimate of the neuropsychiatric examiner at the time, compared with the rating of the recruit's commanding officer after service of one year or longer. The commanding officer was requested to estimate the soldier's value to the service under the following headings: Quickness to learn, neatness, discipline, trustworthiness. Scoring was to be made as poor, fair, good or excellent. It will be appreciated that it would be difficult to determine exactly any one of these qualities at the time of examination for enlistment by any test for intelligence, with the exception of the quality, quickness to learn. The quality of neatness may be guessed at, and fairly accurately in most cases, by the applicant's appearance at the time of examination. The tables given below show in most cases the results under the heading, "Quickness to learn" alone, as well as in combination with the other qualities named. It must also be appreciated that the standards in the service were undoubtedly lower in 1921, at the time the commanding officers' ratings were given, than they previously were in the peace-time army, or now are. Therefore it is safe to assume that more liberal ratings were given than would have obtained at any other time.

In considering the results it should be borne in mind that, as has already been indicated, only such men as appeared to be borderline, as shown by their behavior or appearance in the examining rooms, were included in this series. There were thus excluded the very promising and the definitely unpromising applicants. No extended description of the tests used will be given here. With the

exception of the test for execution, which was devised to fill an apparent need, the tests are standard and are fully described in the texts referred to.

GENERAL KNOWLEDGE

From time immemorial it has been the custom to test an applicant's mental fitness for the service by asking him questions of a general nature along lines of school education, general experience and his own life history. This serves to bring out his intellectual equipment, the results of self-improvement when compared with his opportunities and to demonstrate his emotional response to a certain degree. As a control, this method was used on all applicants to whom psychometric tests were given. The questions asked were identical or nearly so in all cases. Sample questions: "Where born?"; "Date of birth?"; "Age?"; "Name the capital city of your home state"; "Who is president of the U. S.?"; "What is the largest river in the U. S.?"; "Who is Pershing?", etc.

Results are tabulated below:

Actual number rated	Rating	Rating by C. O. on quickness to learn			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
184 (100%)	Poor	19	26	45	10
84 (100%)	Fair	13	27	60	0
96 (100%)	Good	7	12	81	0
60 (100%	Excellent	14	14	72	0

Actual number rated	Rating	Rating by C. O. on all military qualities			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
184 (100%)	Poor	28	19	36	16
84 (100%)	Fair	18	16	49	17
96 (100%)	Good	6	20	49	25
60 (100%)	Excellent	3	22	59	16

EXECUTION

The test for execution consisted in having the applicant perform a set of movements involving both arms and legs, to verbal commands, it having been previously determined by the official Literacy

Test that he had a working knowledge of the English language. The test consisted of commands given slowly and distinctly as follows, the commands not being repeated: (1) Put right hand on left ear. (2) Walk forward six steps, then walk backward two steps, then walk forward four steps. (3) (referring to numbered squares painted upon floor): Start in square number one, jump over square two, step into squares number three and four and jump over square number five. (4) Walk forward four steps, turn body around twice to right, then walk backward one step, then hold your left hand above your head.

Results:

Actual number rated	Rating	Rating by C. O. on all military qualities			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
42 (100%).....	Poor.....	27	15	37	21
21 (100%).....	Fair.....	0	21	23	56
69 (100%).....	Good.....	13	15	47	25
18 (100%).....	Excellent.....	0	29	31	40

RECRUIT PSYCHOLOGICAL EXAMINATION

This test for illiterates was published and prescribed by the War Department under date of October 3, 1919. It was prepared by the Surgeon General's Office upon receipt of the following letter from the Adjutant General:

Beginning May 1, 1919, recruiting agencies will accept, for enlistment, illiterates and non-English-speaking citizens and aliens. In order that only men with sufficient intelligence to perform the duties of a private soldier may be accepted, it is desired that you prepare without delay a psychological test for applicants of aforesaid class. . . . It should be a simple test; one that can be applied by almost anyone and one that will determine whether or not an applicant possesses the necessary degree of intelligence to permit him, with proper training and thorough instruction in English, to carry on in the Army.

This R. P. E. consisted of four tests of four demonstration problems and ten test problems each and arranged approximately in order of difficulty. The material consisted of pictures and diagrams furnished by the War Department. It was given without the use of words. If a man could not understand what was wanted after the demonstrations were carefully given, that fact, in itself,

was a cause for rejection, for it was shown that feebleminded males of mental age of eight years understood dumb show. The total score required for passing was prescribed by the War Department as 20 points, or one-half the possible number. This test was used on all illiterates reaching the recruit depot after the receipt of the instructions.

Results:

Actual number rated	R. P. E. score	Rating	Rating by C. O., quickness to learn			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
12 (100%).....	Below 20....	Poor.....	72	4	12	12
104 (100%).....	20–30.....	Fair.....	6	44	44	6
124 (100%).....	31–35.....	Good....	14	22	36	29
104 (100%).....	36–40.....	Excellent.	7	27	33	33

Actual number rated	R. P. E. score	Rating	Rating by C. O., all military qualities			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
12 (100%).....	Below 20....	Poor.....	60	0	10	30
104 (100%).....	21–30.....	Fair.....	5	22	41	32
124 (100%).....	31–35.....	Good....	11	12	35	42
104 (100%).....	36–40.....	Excellent.	5	14	37	44

PICTORIAL COMPLETION TEST

This test was devised and described by Healy (3). The material consists of a highly colored picture, 10 by 14 inches, representing an outdoor scene with ten discrete, simple activities going on. Mounted on ten 1-inch squares are pictures of objects which are needed to complete the sense of each separate activity, spaces for which are left in the picture proper. Besides these ten squares, there are forty other 1-inch squares, thirty of them bearing pictures and ten of them blank. Healy stated:

We evidently have in our pictorial completion a test for ability primarily adapted to the child type of mind. . . . The performance gives a remarkably good chance to see the mind at work. Mental control and association processes are peculiarly laid bare. The performance of naive individuals of ordinarily good intelligence should be better than five minutes with not more than one illogical, and two logical errors. A worse record than this would arouse suspicion of mental defects.

Results:

Actual number rated	Score	Rating by C. O. on quickness to learn			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
36 (100%)	Poor	28	33	27	12
24 (100%)	Fair	22	33	33	12
64 (100%)	Good	24	24	35	17
96 (100%)	Excellent	0	33	60	7
Actual number rated	Score	Rating by C. O. on all military qualities			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
36 (100%)	Poor	21	18	31	30
24 (100%)	Fair	9	33	41	17
64 (100%)	Good	15	20	35	30
96 (100%)	Excellent	12	21	40	27

POINT SCALE

The Yerkes-Bridges Point Scale is a modification of the original Binet-Simon Test giving credits for all work done by subject to a more complete degree than is possible by the latter. It is an individual test (4).

Results:

Actual number rated	Score	Rating	Rating by C. O., quickness to learn			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
30 (100%)	0–40	Poor	25	50	25	0
55 (100%)	41–49	Fair	9	36	46	9
105 (100%)	50–63	Good	19	31	43	7
20 (100%)	64+	Excellent	0	0	50	50
Actual number rated	Score	Rating	Rating by C. O., all military qualities			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
30 (100%)	0–40	Poor	14	43	31	12
55 (100%)	41–49	Fair	7	19	34	40
105 (100%)	50–63	Good	7	20	47	26
20 (100%)	64+	Excellent	0	37	25	38

Note: Score 0–40 equivalent to mental age 0– 7.8 years.
Score 41–49 equivalent to mental age 8– 8.9 years.
Score 50–63 equivalent to mental age 9–10.8 years.
Score 64 equivalent to mental age 11 plus.

STANFORD REVISION OF BINET-SIMON TEST

This is the test prescribed for use in doubtful cases by Army Regulations 40–105 (the regulations in force at this time). It was described by Terman in "The Measure of Intelligence" in 1916 and has generally superseded the original Binet-Simon method as being more applicable to American use. The applicants tested have been divided into four groups, none below seven years mentally were enlisted.

Results:

Actual number rated	Group	Mental age	Rating by C. O., quickness to learn			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
32 (100%)	I	7–7.9	30	25	45	0
99 (100%)	II	8–8.9	0	12	50	38
103 (100%)	III	9–9.9	18	12	58	12
48 (100%)	IV	10 plus	0	66	0	34

Actual number rated	Group	Mental age	Rating by C. O., all military qualities			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
32 (100%)	I	7–7.9	25	6	63	5
99 (100%)	II	8–8.9	2	10	30	58
103 (100%)	III	9–9.9	7	23	55	15
48 (100%)	IV	10 plus	0	25	50	25

BETA TEST

On a group of illiterate accepted applicants, tests 3, 4 and 6 of the War Department Beta Test were used. The complete Beta was not used on account of time limitations. The tests were given to groups of from ten to twenty-five applicants daily. Based on the table of variables reported by the Division of Psychology, as the result of the use of the test on white draftees, the median value of the three tests selected by me were in proportion to the value of the whole as 1 to 1.99 and the scores are stated on that basis. The equivalent letter ratings are those standardized during the war. Only those applicants earning rating of between C and D were

selected for reporting by commanding officers. Those rated as D minus were rejected for enlistment.

Results:

Actual number rated	Weighted score	Letter rating	Rating by C. O., quickness to learn			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
63 (100%)	20–30	D	0	10	0	0
74 (100%)	30–45	D	11	11	67	11
68 (100%)	45–55	C–	0	50	25	25
41 (100%)	55–64	C–	14	57	14	15

Actual number rated	Weighted score	Letter rating	Rating by C. O., all military qualities			
			Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
63 (100%)	20–30	D	12	38	50	0
74 (100%)	30–45	D	8	25	53	14
68 (100%)	45–55	C–	0	19	53	28
41 (100%)	55–64	C–	14	32	29	25

Note: No applicant in this series scored above 64 (C–).

RECOMMENDATION BY NEUROPSYCHIATRIC EXAMINER

The following table shows the military worth of those recruits who had been definitely recommended either for enlistment as "borderline risks" or for rejection.

By "borderline risks" was intended to designate those cases who stood fairly low in the formal tests for intelligence and application, but who, according to the standards then in use generally, were not recommended for outright rejection. Those cases were intended to be rejected by the Chief Medical Examiner if the physical examination should disclose other signs of organic inferiority. Those recommended for "rejection" tested so low as to warrant a definite recommendation, but various other considerations outweighed this recommendation in the judgment of the Chief Examiner and some cases so classified were enlisted.

Results:

Actual number rated	Rating by N-P examiner	Rating by C. O.			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
26 (100%)	Borderline (*a*)	19	25	41	15
18 (100%)	Rejectable (*b*)	19	21	46	14

Note: (*a*) Includes 6 men discharged under A. R. 148½ and 9 deserters.
(*b*) Includes 3 men discharged under A. R. 148½ and 4 deserters.

MILITARY FAILURES

Of a total of 79 military failures who were so regarded because of discharge under A. R. 148½ or by Certificate of Disability for Discharge on account of Constitutional Psychopathic Inferiority or Mental Deficiency, or who received a discharge other than honorable, or became deserters or general prisoners, 39 per cent were rated by intelligence tests at time of enlistment as "poor," 29 per cent were rated at "fair," 24 per cent as "good," and 8 per cent as "excellent." Here one must again appreciate that military delinquencies are not all chargeable to lack of intelligence but are more frequently due to an emotional non-adjustment.

RECAPITULATION

What, then, on the basis of this investigation, may we expect to be the value of tests for intelligence as performed in the examining room prior to enlistment?

Actual number rated	Rating by examiner	Rating by C. O., quickness to learn			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
77 (100%)	Poor	21	46	29	4
109 (100%)	Fair	10	27	50	13
158 (100%)	Good	14	25	47	14
97 (100%)	Excellent	6	33	38	23
Actual number rated	Rating by examiner	Rating by C. O., all military qualities			
		Poor, per cent	Fair, per cent	Good, per cent	Excellent, per cent
77 (100%)	Poor	27	20	37	16
109 (100%)	Fair	7	21	39	33
158 (100%)	Good	8	19	46	27
97 (100%)	Excellent	5	26	39	30

SUMMARY

Reports were received from commanding officers as to the military progress after one year's or more service in the cases of 441 enlisted recruits. Results as tabulated show that of the applicants enlisted who rated as "poor" or "fair," approximately one-half proved to be poor or fair in their ability to learn the duties of a soldier in peace-time and that the other one-half were rated "good" or "excellent" in the same quality by their commanding officers. As regards the report on "all military qualities," approximately 38 per cent of those rated as "poor" or "fair" proved to be poor or fair soldiers. Of those rated as "good" or "excellent" in the tests, 61 per cent proved to have had ability to easily learn the duties of a soldier, 39 per cent were backward (but probably not because of lack of native ability), and 71 per cent proved to be good all-round soldiers.

CONCLUSIONS

Therefore, judging from the comparatively small number of cases under investigation, it would seem that psychometric tests are of value in determining that an applicant possesses the native ability to make good as a soldier, providing he has the requisite stability of character, but that a borderline showing in a given test or series of tests for intelligence, should not be in itself a cause for rejection, for oftentimes it appears that a recruit of low average intelligence has been used to good advantage in his organization as a "hewer of wood and a drawer of water."

REFERENCES

(1) Memoirs American Academy of Sciences, Vol. xv, 1921.
(2) Annual Report, Surgeon General of the Army, 1921.
(3) Healy: Psychol. Rev., 1914, 21, 189.
(4) Yerkes, Bridges and Hardwick: A Point Scale of Measuring Mental Ability. Warwick and York, 1915.

RELATION OF THE AMERICAN RED CROSS TO THE MILITARY SURGEON

By SARAH ELIZABETH PICKETT and FLORA L. BRADFORD, R. N.

OFTENTIMES concerning an organization which is everybody's business, considerable tradition and much popular hearsay are known, but very little authoritative knowledge. Such a condition may be said to exist regarding the relation of the American Red Cross to the Military Establishment.

Because the modern institution of the Red Cross is so essentially a civilian movement, few persons of its constituency, among these army and navy officers, realize how great a part the Military Establishment has played in the development of the Red Cross. A brief résumé of Red Cross history will show that the prime leaders of the Red Cross movement have been military commanders who, instead of being oblivious to the humanitarian needs of their men, have been only too eager to further them through aiding the Red Cross by every means within their power.

When a Swiss civilian, Henri Dunant, saw in Lombardy, Italy, on a hot June day of 1859, the battlefield of Solferino, he gained the same general impression of war as that classically described by General Sherman. Then, like other civilians who have for the first time witnessed a battle, he went home to Geneva and shortly afterwards wrote a pamphlet, *The Souvenir of Solferino,* in which he described everything he had seen. Up to this time it may truly be said that the waging of war in all its phases had been delegated to the Military Establishment, and civilians, with the exception of Miss Nightingale in the Crimea, had kept strictly out of the melée.

Not so, however, after *The Souvenir of Solferino* had set altruistic and perhaps somewhat sentimentally minded persons all over the world by the ears. From that time on, civilians began to feel that they had an unalienable right to help nurse the poor soldier, to bring him garments and jellies, to trot along beside the passing legions doing a thousand and one pleasant small things for the troops, earning the disgust of some army officers who felt that "soldiers are better off without all this coddling," and to the approval of others who saw that the soldier after all is a man and oftentimes a boy, and hence needs some coddling to help keep up his morale. Thus the ideal of the helpful civilian volunteer gained adherents throughout the world and has since crystallized the modern institution of the Red Cross.

When *The Souvenir* appeared in pamphlet form in Geneva in 1862, a copy fell into the hands of Gustave Moynier, who was both an altruist and a brilliant young international lawyer. In reading *The Souvenir* he hit upon Monsieur Dunant's suggestion that "in all civilized countries permanent societies of volunteers be organized which in time of war wound render succor to the wounded without distinction of nationality." So impressed was he that he appointed from the Genevese Society of Public Utility, a local philanthropic organization of which he happened to be president, a committee of five to study ways and means of carrying out this suggestion. Here enters the military, for General Dufour, the venerable commander-in-chief of the Swiss Army, was chairman. Two Swiss physicians, Drs. Louis Appia and Theodore Maunoir, with Henri Dunant as secretary and Moynier himself, completed the committee which studied *The Souvenir* and then recommended that a conference of military authorities and philanthropic societies from all Europe meet at Geneva to discuss ways and means of carrying Monsieur Dunant's ideas into operation.

On October 26, 1863, the conference met with delegates from fourteen European governments and seven philanthropic societies. These delegates then drew up the famous resolutions which formed the backbone of the Treaty of Geneva and the modern institution of the Red Cross. Here again the historian may see the gloved hand of the military, for these resolutions are drawn with wisdom and a far-seeing practical knowledge of the fact that civilians, to be truly useful, must be under the complete direction of army officers in the theater of war. Phases emphasizing this subordinate relation are "to cooperate in time of war by all means in its power *with the Sanitary Service of the Army* (Article 1)"; *"in conjunction with the military authority,* shall arrange places for the reception of the wounded" (Article 5); *"on the demand or with the concurrence of the military authority* the committees shall send volunteer nurses to the field of battle. They shall place them *under the direction of military chiefs* (Article 7)."

Before the Treaty of Geneva or the International Red Cross Treaty could be formulated, the Red Cross idea had to be sponsored by a military leader. In 1864, the Swiss Federal Council, supported by Napoleon III, addressed an invitation to twenty-five sovereign states asking them to send representatives to a Diplomatic Convention to be held in August of that year at Geneva. Out of this convention, as is now common knowledge, developed the Treaty of Geneva and the Red Cross.

At the Diplomatic Convention the United States was represented by two "unofficial" delegates, George C. Fogg, then American Minister to Switzerland; and Charles C. P. Bowles, European agent of the Sanitary Commission. The year of this convention marked the last year of the Civil War; hence the United States Government was too occupied with civil strife to empower its delegates with authority to act. Moreover, through the Sanitary Commission, civilians of the north had already been conducting comparatively efficient war relief, and they had no reason to believe that the continental idea of the Red Cross was superior to their own self-evolved organization. Thus the Sanitary Commission marked the first step taken by the United States toward unification of volunteer relief under a single organization, but this was only a step. How enthusiastic volunteers such as Miss Clara Barton, "Mother Bickerdyke" and others went into the theater of war to care for the wounded has become an American tradition.

Following the convention, Mr. Bowles submitted to Secretary of State Seward a report embodying the aims and text of the Treaty of Geneva, but no official action was taken on it. The Government seemed to regard the Treaty as an entangling foreign alliance, and the American people were weary of war and all that pertained thereto. True, in 1866, the leaders of the Sanitary Commission endeavored to introduce the Red Cross movement into the United States, and on July 20, 1866, formed "The American Association for the Relief of Misery on the Battlefield," with its insignia the Red Cross. Its development, however, was doomed in a nation not signatory to the treaty under which it must function in time of war, so in 1871 it was disbanded.

How Miss Barton in 1869 met in Geneva, Switzerland, the leaders of the Red Cross movement; how they asked her to try, on her return to America, to secure the adhesion of the United States Government to the Treaty of Geneva that an American Red Cross society might be organized; how Miss Barton in 1881 interested President Garfield and James G. Blaine, then Secretary of State, in the idea; and how in July, 1881, the "American Association of the Red Cross," with Miss Barton as president, was incorporated under the laws of the District of Columbia, is now common knowledge. Before the treaty could be signed, President Garfield was shot, but on March 1, 1882, President Arthur signed it, and the Senate some days later confirmed it without a dissenting voice, thus giving the United States its place among the thirty-one nations then signa-

tory to this international organization of war relief on the part of civilian volunteers.

During its eighteen years of life the American Association of the Red Cross busied itself largely in disaster relief in the United States. However, in 1898 came an opportunity for Red Cross aid in time of war. To relieve the sufferings of Cuban *reconcentrados* a relief ship, *State of Texas,* was sent under the Red Cross flag to Cuba, but before it could land its supplies the United States declared war on Spain (April 25, 1898) and the *Texas* was ordered with United States transports to Santiago, lest she fall into enemy hands if she went to Havana. On the *Texas* were Miss Barton and several Red Cross nurses, so the *Texas* went to Siboney, a landing station for American troops, among whom Miss Barton had heard that sickness had developed. In this incident it may truly be said that American Red Cross nurses served for the first time with United States troops. When the *Texas* was lying in Siboney Harbor, General Ireland, then a young medical officer, went down to the beach and asked the nurses aboard the *Texas* to come ashore and help. This request was at the time a radical departure from army precedent, but the services of these nurses formed one of the entering wedges for professional nursing service in the United States Army. How Surgeon General Sternberg subsequently authorized the employment of female contract nurses in the United States Army, and how units of professional nurses served with distinction, is now also common knowledge. It is of interest, however, to note that these nurses and leading volunteers of New York City brought forward in 1900 the bill authorizing the creation of the Army Nurse Corps, to consist of a superintendent, and of chief, staff and reserve nurses who should all be graduate women nurses in the modern professional sense. This bill was incorporated in the Army Reorganization Act, and in 1901 became law.

In 1900 came also the first reorganization of the American Association of the Red Cross, and in 1904 a second one, at which time Congress gave to it its present great charter which defines its purposes and provides for its present organization and administration. Of the charter's three purpose-clauses, two define the relation of the organization to the Military Establishment, i.e., "to furnish volunteer aid to the sick and wounded of armies in time of war in accordance with the spirit and conditions of the Treaty of Geneva"; and "to act in matters of voluntary relief as a medium of communication between the people of the United States and their Army and Navy."

As to organization, the new charter provided that the President of the United States should appoint to membership on the Red Cross governing body, the Central Committee, a representative each from the War and Navy Departments. These representatives are now General Ireland and Admiral Stitt, who serve also as members of the Executive Committee. The first three chairmen of the Central Committee, as appointed by the President of the United States, were also men of the Military Establishment—Admiral William K. Van Reypen, one-time Surgeon General of the United States Navy; and Generals Robert M. O'Reilly and George W. Davis, both one-time Surgeons General of the United States Army. In the foremost rank of war leaders of the American Red Cross are persons who have been associated with the Army and Navy, such as Jane Delano, organizer of the Red Cross Nursing Service and the second Superintendent of the Army Nurse Corps; Gen. Jefferson R. Kean, M.C., organizer of the Red Cross base hospitals; and Grayson M. P. Murphy, a West Point man and for nine years a reserve officer who was the first American Red Cross Commissioner for Europe. Other army and navy men who labored in the interests of the Red Cross were Col. Robert U. Patterson, Col. Winford Smith, and Commander Theodore Richards. With these leaders to advise, it is not to be wondered that the society was able, between 1917 and 1923, to expend, in complete harmony with the Military Establishment, vast sums in the interests of men who wore the United States uniform in the European War and their families. These leaders knew military procedure and were thus able to direct American Red Cross activities so that they would coincide with military regulations and usage. The present officers of *liaison* between the American Red Cross and the Military Establishment are James M. Phalen, Lieut. Col., M.C., U.S.A.; and W. J. C. Agnew, Lieut., M.C., U.S.N.

Unique, but nevertheless true, is the fact that the Military Establishment has also played an important part in American Red Cross activities in time of peace. The author of the first Red Cross textbook in *First Aid to the Injured* and the early organizer of the now extensive class instruction which has since developed, was an officer of the United States Medical Corps, Col. Charles Lynch. The textbook in *Home Hygiene and Care of the Sick*, another Red Cross course of instruction and one in which 325,000 women and girls have been certified since 1914, was written also by two women connected with the Army, Miss Delano and Isabel MacIsaacs, third superintendent of the Army Nurse Corps.

As the Army and Navy are the will of the nation mobilized for defense, so is the Red Cross the soul of the nation mobilized for service, and in the words of Judge John Barton Payne, chairman of the American Red Cross, "The men who served the United States in the World War, and are suffering the consequences, constitute our first responsibility, and there should be no hesitancy in meeting that responsibility wherever it confronts us. Had it not been for the work of the Red Cross there would have been a great deal more suffering than there has been. We want to do our best in this emergency. It is going to be with us a long time and there is abundant opportunity for real service."

A tabulation covering the period from July 1, 1917, to June 30, 1923, shows that at the end of the current fiscal year there will have been spent by the American Red Cross, nationally and through the chapters, more than $70,000,000 in providing service to the men who wore the American uniform in the World War.

Following are the figures covering expenditures for service men and ex-service men during each year since this work became a part of the American Red Cross program:

By the National Organization

1917–1918	$4,788,899.89
1918–1919	14,142,588.71
1919–1920	5,748,354.95
1920–1921	3,187,305.22
1921–1922	3,034,750.32
1922–1923 (estimated)	2,440,000.00

By the Chapters

1917–1918	$2,420,000.00
1918–1919	9,550,000.00
1919–1920	8,410,000.00
1920–1921	6,400,000.00
1921–1922	5,340,000.00
1922–1923 (estimated)	4,600,000.00

A process of evolution created the present War Service program which embraces activities that were under the Departments of Military and Civilian Relief immediately prior to, and during, the World War, together with the distinctive post-war activities that have developed since the signing of the armistice. This process of evolution, by means of which the work for the Army and Navy and for the ex-service men has been brought under a single head, is historically interesting.

The amplified organization plan announced at the annual meeting of the American Red Cross, December, 1915, embodied two departments, the Department of Military Relief and the Department of Civilian Relief. The former was under the directorship of Col. Jefferson R. Kean, of the Medical Corps of the United States Army, while Ernest P. Bicknell, who previously had been Director General of the organization as a whole, became Director General of Civilian Relief.

Colonel Kean served until July, 1917, when he was ordered to France by the War Department. It was due to his foresight and efficient work that on April 12, one week after the United States declared war against Germany, the American Red Cross was able to report the organization of 36 army base hospitals, and that the six base hospitals sent to France in May, 1917, at the request of the Allies, constituted the first branch of the United States Army to enter Europe on war service.

When Colonel Kean was recalled from Red Cross service, John D. Ryan, president of the Anaconda Copper Company, became Director General of Military Relief. Mr. Ryan resigned from the position in October, 1917, to accept appointment by President Wilson as a member of the Red Cross War Council, and was succeeded by Jesse H. Jones, of Texas. Colonel Bicknell served as Director General of Civilian Relief until he went to France with the First Red Cross Commission to that country, being succeeded in the home office by Frank W. Persons.

When the United States entered the war, both the departments were ready to function on a large scale for the men entering the service of country, and within a few months both were carrying on their distinctive activities with a thoroughness that was in keeping with the spirit which had caused the American people to contribute more than one hundred million dollars in the first Red Cross War Fund Drive and in conformity with the nation's determination to see the war through to unconditional victory. Associated with the Director General of Military Relief were two Assistant Directors General, Lieut. Col. C. H. Connor, Medical Corps, U. S. A., and Harry B. Wallace. Under the control of these heads were the following bureaus: Medical Service, Base Hospitals, Camp Service, Canteen Service, Motor Corps Service and Sanitary Service. Winthrop Murray Crane, Jr., was an Assistant Director General from August, 1917, to November, when he resigned to accept a position in the Ordnance Department of the Army.

The Bureau of Medical Service had two divisions—Enrollment and First Aid. The Enrollment Division was created in February, 1916, to assist in the organization and instruction of Red Cross War Relief Units. In October, 1917, the Bureau of Medical Service for Foreign Commissions (newly organized under the War Council) took over the work of selecting physicians for foreign service, and the work of listing volunteers for other Red Cross Service was transferred to the new Bureau of Personnel. The work of the First Aid Division was immensely increased by the call to the colors. It was aimed to give first-aid instruction to every person of draft age wishing to take the same.

The Bureau of Camp Service was organized in the summer of 1917, its purpose being to relieve suffering and distress in whatever forms they might appear among the soldiers and sailors in the United States, and to provide for them such comforts as the Red Cross could furnish. The Bureau of Sanitary Service was created in October, 1917, to aid local Public Health authorities in improving the sanitary conditions in and about the army camps, cantonments and naval bases. The names of the other bureaus above mentioned are self-explanatory.

The Department of Civilian Relief functioned as the Home Service agency in connection with the Red Cross War Activities. All know what this service meant and the vast extent of the work undertaken and its value in assisting in the preservation of the morale of the American Army and Navy, together with the results accomplished in meeting the needs of dependents of soldiers and sailors, likewise are matters of common knowledge to those who were enlisted in Red Cross effort throughout the days of war.

The set up, as given, continued on the same general lines through and following the war, until 1921, the various services and divisions being expanded to meet the arising needs and emergencies. Thus, Camp Service came to take on new responsibility and, at the special request of the Government, particular attention was given to extending the work in hospitals, notably in the matter of providing recreation for the patients and convalescents, and to the men in the peace-time Army and Navy.

Mr. Jones remained as head of the Department of Military Relief until his appointment as a member of the War Council, January, 1919, when he was succeeded by W. J. Hiss as Director General. H. R. Fardwell succeeded Mr. Hiss in May, 1919. Mr. Persons resigned as Director General of Civilian Relief, January 3,

1919, Willoughby Walling, of Chicago, then becoming Acting Director General until February 15, when J. Byron Deacon became head of the department. Mr. Deacon was succeeded by Ward Bonsall, February 9, 1920, and he, in turn, was succeeded in charge of the Civilian Relief operations by Lewis E. Stein, May 1, 1920.

The great after-care task of serving the disabled ex-service men and their families was developed in close cooperation with the United States Public Health Service, War Risk Insurance Bureau, Federal Board of Vocational Education and the United States Veterans Bureau—and at the request of those agencies. Home Service in the United States Public Health hospitals inaugurated at the request of the Public Health Service on March 12, 1919, has been extended today to all hospitals where Veterans Bureau beneficiaries are cared for. The Bureau of Medical Social Service, later organized, is now a part of War Service.

Since 1920, changes in the organization of the American Red Cross, to meet conditions pertaining to the permanent work on a peace-time basis, have brought about the abolition of the Departments of Military and Civilian Relief and the concentration of their activities in specific services. Early in the year 1921 the Department of Civilian Relief was separated into Civilian Home Service and Post-War Service, the latter service embracing the activities relating to ex-service men. July 1, 1922, the Post-War Service activities and those still operated under Military Relief were combined under the head of War Service.

Major Arthur E. Foote, who had been the Director of Post-War Service, was succeeded by Thomas DeC. Ruth as Director of War Service, who subsequently resigned and was succeeded by Robert E. Bondy.

In addition to other duties, the head of War Service, under the organization now effective, is liaison officer of the Red Cross with the Veterans Bureau, American Legion and other agencies concerned with the welfare of ex-service men.

In addition to the work of this highly specialized War Service which deals only with the needs of the service and ex-service men, practically all other services of the American Red Cross are contributing in some measure to their welfare. Of special importance in this connection is the work of the Nursing Service which is by congressional enactment the reserve of the Army Nurse Corps. By request it occupies the same relation to the Navy, the United States Public Health Service, and the Veterans Bureau.

The affiliation of organized nursing bodies with the Red Cross was the outgrowth of nursing experiences during the Spanish-American War, and began in 1908–09.

In May, 1909, the United States War Relief Board proposed placing the Red Cross Nursing Service under a special sub-committee to be composed of a chairman and fourteen other members. The provisions of the resolution gave a membership of nine trained nurses on a committee of fifteen.

After the annual meeting of the Red Cross in December, 1909, the War Relief Board named the National Committee on Red Cross Nursing, and Jane A. Delano was made chairman. This position she held until her death nearly ten years later, serving as a full time volunteer throughout this period. The present chairman of the National Committee is Clara D. Noyes, who is also the National Director of the Nursing Service.

The plan of enrollment consists first of all in the organization of State Committees of graduate nurses nominated by the State Nurses' Associations. The State Committees in turn nominate the local committees, which are then appointed by the National Committee. The local committee collects the credentials, interviews the applicant, and prepares the application of the nurse who applies for enrollment, forwarding these for final action and appointment to the National Committee at the office at Washington where the file of Red Cross nurses is maintained.

There are 225 committees with 1,500 nurses rendering this service as volunteers. Nurses are enrolled upon both their personal and professional qualifications, and the standard is as high as it can be pushed.

The Red Cross Nursing Service is unique in character. For many years there was not in any other country in the world, excepting Japan, one organized on the same plan, while none yet compares in the size of enrollment and in the strength of organization with that of the American Red Cross. It advises upon all matters of Red Cross nursing standards in this country and wields an incalculable influence along this line in other countries of the world as well.

At the beginning of the World War there were 9,000 enrolled Red Cross nurses and 38,000 at its close. There are at the present time approximately 40,000 nurses enrolled in this service, 20,000 of whom were assigned to service with the Army, Navy, and American Red Cross during the war. Of this number, 294 have been cited or

decorated by foreign powers; 4 hold the Distinguished Service Cross of our own country; and 24 the Distinguished Service Medal; 268 nurses died in line of duty, or within a year after the signing of the armistice, while we have not yet been able to get a positive record of those who have been physically disqualified.

The Red Cross, national and international, has come to us out of the very depths of human suffering. War with its concomitants is the rank soil out of which has sprung the greatest Organization of Mercy the world has ever known, and it has been grown primarily for the defenders of this and other countries. It is therefore logical and right that they should continue to maintain a foreground place in the program of development of this great humanitarian enterprise, even as they have so largely molded its history in the past.

We are entering upon a new era. What it is to hold, no one can foresee. The future is heavily charged with forces which as yet defy analysis. The organizers of the Red Cross could not forecast in detail the demands which lay ahead—nor can we. We only know that the accomplishments of the organization in its care of the service men in the past are the sign and seal of its pledge to them for the years to come, and the future is as secure as the past has proven.

AN EARLY EPIDEMIC OF TYPHOID FEVER AMONG SOLDIERS

By Major ARTHUR N. TASKER
Medical Corps, United States Army

THE HISTORY of no disease is more interesting than that of typhoid fever. The almost hopeless confusion which so long existed between this infection and typhus fever gave way with most aggravating slowness to the light of differential diagnosis. Typhoid thus "stands as an example of the difficulties which may attend the recognition of a disease."[1] It is a matter for American consideration that a very important part of the knowledge possessed today by the medical profession concerning this disease in all its phases and manifestations is due to the labors of workers in our own country. Sir William Osler gives due recognition to this fact in his remark that "of no other disease can we read as full a history from American sources alone."

From the days of earliest antiquity physicians have recognized fevers with which delirium was associated. Hippocrates and Galen made frequent and extensive mention of such conditions, but there seems to have been no recognition on their part of any distinction between typhoid, typhus, malaria, plague and other communicable diseases of which a febrile reaction is a characteristic concomitant. Real clinical recognition of typhoid fever seems to have been first made in the 17th century, but for many years thereafter typhoid and typhus were quite generally confused; and it does not appear beyond question of doubt that those who wrote most clearly and distinctly of cases and epidemics of typhoid had any real conception of the fact that it was an entity distinct from typhus fever, clinically as well as pathologically.

The number of medical authors in whose writings unmistakable references to typhoid fever occur is almost legion. Sydenham, Baglivi (who described "Febris mesenterica"), Lancisi (perhaps the first to describe perforation of typhoid ulcers), Hoffman (who is credited by McCrae with being the first to differentiate between typhus and typhoid),[2] and Panarolis in Italy, — all these belong essentially to the seventeenth century. The lists of the eighteenth and nineteenth centuries are much longer. Thus, Strother and

[1] McCrae, Thomas: Osler's Modern Medicine, Vol. II, p. 70.
[2] *Ibid.*, p. 73.

Gilchrist in Great Britain describe a "slow or slow nervous fever." Huxham (1734) quite definitely distinguished between a "slow nervous fever" and a "putrid malignant petechial fever." Manningham, Riedel, Roderer, Wagler, and Morgagni added to the sum total of the knowledge concerning typhoid infection. John Hunter "had two specimens showing the characteristic intestinal lesions."[3] Great advances were made in France in the pathology of the disease through the studies of Prost, Broussais, Petit, Serres, Bretonneau (to whose suggestion the name "Dothienenterite," by which the malady is commonly known in France, is due), Trosseau, Velpeau, Louis (the preceptor of many Americans and the first to employ the term "Fièvre typhoïde") and others.

Among the earliest American pupils of Louis was W. W. Gerhard of Philadelphia. With Louis he saw many cases of typhoid fever in Paris, and upon his return to America he recognized a disease prevailing in his own city as the same which he had seen in Paris. In 1836 an epidemic of typhus fever appeared in Philadelphia, and to Gerhard was thus afforded a marvelous opportunity to compare these two maladies. McCrae thus refers to Gerhard's experiences: ". . . in 1836 there was an epidemic of typhus fever in Philadelphia, and as Stillé says of Gerhard, 'he may be said to have been the first to meet the two diseases face to face with a full acquaintance of one of them and a daily increasing knowledge of the other.' In the report of this epidemic, published in 1837, he sets out very clearly the distinction between the two diseases as well as their differentiation from malarial fever. This paper should be read by every student of the disease, for it is the first in which typhus and typhoid fevers are clearly distinguished and thoroughly contrasted."[4]

Schönlein proposed in Germany the names "Typhus abdominalis" and "Typhus exanthematicus." Wilks coined the phrase "enteric fever" by which the disease is usually known in Great Britain. Budd, an Englishman, was the first to propound a theory concerning the mode of infection which is quite in harmonious accord with the facts as they are known today. He conceived of the etiological factor as being present in the intestinal evacuations of patients suffering from the disease. He denied the possibility of its spontaneous occurrence and emphasized the fact that each case must depend upon invasion of the human organism by the causative agent derived from some previously existing source. He

[3] *Ibid.*
[4] *Ibid.*, p. 74.

developed the epidemiology of typhoid fever more than any of his predecessors, but his teachings were not widely accepted since they ran counter to the then prevailing notions. The discovery of *Bacillus typhosus* by Eberth in 1880 was the starting point for rapid and extensive advances in the knowledge of many phases of this disease concerning which conjecture had previously been rife, but which had lacked the proof of experimental demonstration. The serology of typhoid fever and prophylactic inoculation against it are developments of so late a date that all members of the present medical generation are familiar with them.

Among the earlier investigators, one whose name has not yet been mentioned was Thomas Willis (1621–1675). To him undoubtedly belongs the credit of having first described the clinical aspects of typhoid fever in accurate fashion and of having distinguished it in a purely clinical sense from typhus fever and plague. Willis, the son of a farmer, was Sedleian Professor of Natural Philosophy at Oxford in 1660. His extraordinarily detailed description of the nervous system is contained in "Cerebri anatome; cui accessit nervorum descriptio et usus" (1664). Herein are to be found the classification of the cerebral nerves and the first description of the spinal accessory nerve or "nerve of Willis," as well as of the "arterial circle of Willis" lying in the base of the cranium. He was a very astute clinician and capable of the most painstaking and careful observation. He described myasthenia gravis, and was an early, if not the first, observer of the phenomenon known to otologists as "paracusis (or hyperacusis) Willisii." This condition he noted in a deaf woman who could hear only when a drum was being beaten. He published in 1674 a treatise on materia medica, the "Pharmaceuticae rationalis." He was the foremost exponent in his own time of chemiatry ("the treatment of disease founded upon the Paracelsian doctrine of the chemical nature of physiological and pathological processes."[5])[6]

There is something very fitting in the fact that the first clear description of typhoid fever—for so long the scourge *par excellence* of armies—should have been written in connection with a military campaign. In his "De Febris" (1659) Willis thus describes in Latin of a most execrable sort (if judged by classical standards) the epidemic of 1643 which attacked the troops of both armies then fighting the Civil War:[7]

---

[5] Century Dictionary and Cyclopaedia, Vol. I, Supplement.
[6] Garrison, F. H.: History of Medicine, 3rd ed., pp. 261–263.
[7] Willis, Thos., De Febris. 1659, pp. 171–175.

Toward the beginning of the spring of 1643 the Duke of Essex besieged Reading which was defended by the troops of the King. During this siege an epidemic disease appeared in both armies; and although he persisted in his campaign until the city had surrendered (both sides having given up hostilities), he nevertheless was obliged to continue his war for several months, not against the enemy, but against the disease. The malady by which his troops had been attacked was so fatal, even as if it were a new mode of death, that there seemed to be no means of averting it even for those who yielded themselves to the exercise of every possible precaution.

Essex soon moved his camp to the Thames river and its immediate neighborhood, where he very quickly lost a large number of his soldiers. The King, on the other hand, returned to Oxford, and here he encamped his troops at first in an open field, and later distributed them among the towns and villages. But this arrangement was not of much avail; for his infantry (who suffered most) being crowded closely together in small tents which were filled with filth of all kinds, squalor, and foul odors, so that even the air itself seemed to be polluted, became sick in great numbers, almost by companies as it were. In time the fever passed beyond the limits of the camp and attacked the unprotected civil population, not only those with whom the soldiers were quartered, but also certain others in passing, who (the severity of the disease being somewhat mitigated among them) were affected with a pronounced daily languor, yet for the most part escaped the severer consequences. About the time of the summer solstice this malady seemed to increase and to manifest more severe symptoms. At the same time it began to attack numerous families and other persons dwelling in the countryside. Still somewhat thereafter it raged in our city and in all the vicinity to a distance of not less than ten miles. Meanwhile, those who were located in other regions at so considerable a distance as to be outside the sphere of contagion, were not immune to the pestilence. This epidemic spread in such wise that the greater part of the people living in its path fell sick of it. Whenever it invaded a home it attacked nearly the whole family, so that there were hardly any well persons left to minister to the sick. Neighbors and servants who were called upon to care for the sick soon fell victims to the same disease, so that finally, through fear, the ill, laboring under the burden of their malady, were shunned by the healthy persons.

No small danger to the general health or even to life itself attended this disease. Old persons suffering from cachexia, consumptives, and those otherwise enfeebled succumbed to this malady in considerable numbers; while not a few boys, youths, and men of mature and robust age died of it as well. I remember that in certain villages nearly all the adults died during this year, so that there hardly remained enough to preserve the customs and privileges of the parish in accordance with the ancient and accepted traditions.

When this disease first began it did not present at all the type of a putrid fever; it was therefore more difficult of diagnosis. At times it seemed to be subsiding as a result of sweating and diarrhœa, but in such cases it was very likely to show an early recrudescence. Very frequently when the conflagration of the blood had continued for six or seven days, and when it seemed that this febrile condition was undergoing a remission and a crisis was taking place, suddenly the fever-producing toxin *(materia adusta)* was transferred to the brain, and the patients continued to suffer a long time, some with active delirium, more with torpor, with pronounced mental weakness, and sometimes with convulsive movements. Very few escaped these symptoms.

About the middle of the summer, when the epidemic was at its height and funerals were frequent, this disease began to manifest its most malignant and pestilential power by open lesions such as exanthematous and macular eruptions. Indeed, at this time, many who had very little fever presented an unequal and usually irregular pulse, and even without manifest increase in respiration, became weak, and their strength very greatly diminished. Others falling sick under similar circumstances presented papules, at times small and red, at other times broad and livid. In many there appeared buboes in the region of the lymphatic glands as in plague, and of these many, without apparently being seriously ill or without any febrile exacerbation having been observed in the blood, suddenly and without warning died. Meanwhile others, becoming soon delirious, suffered the most terrible disorders of their vital processes so long as life remained in them. Those who recovered from this malady without the desired crisis (unless they were relieved more quickly by sweating artificially produced) underwent a protracted convalescence characterized by disorders of the brain and nervous system, sensory stupor, depression of the senses, tremors, vertigo, weakness of the limbs, and convulsive movements.

During the dog days this disease began to be treated not as a fever but rather as a minor phase of plague, and thus antidotal remedies began to overcome it. Venesection was believed at this time to be universally fatal. Vomiting and purgings were induced, but the most powerful remedial measure consisted in inducing profuse perspiration. Certain empirical remedies, prescribed by physicians and secured in the pharmacies for this purpose, do not merit any very great praise. For the first time in this locality a certain powder (*Comitissae Cantii*) began to have a great reputation. Not least known was another powder of ashy color which a certain Aulicus had widely advertised in this city and which was exhibited in several cases with good success. When others began to recommend its use he offered it for sale at a high price. A half dram of this powder was administered in some liquid or other and induced in the patient a most profuse perspiration, as a result of which he was freed from the virulence of the malady. Then there was also that diaphoretic powder (whose preparation I afterward learned from a cousin of its original inventor) which consisted only

in a salt of dried toads and the best wine of lotus, these being lightly calcinated in an earthenware jar.

As autumn progressed, this disease noticeably diminished in its accustomed severity, so that fewer fell sick, and of these the large majority recovered. Finally, as winter came on, this fever almost entirely vanished, and the condition of public health returned to normal in this city and in the surrounding rural districts. Let us examine this disease with reference to its beginning in camp, its pestilential character, its epidemiology, its origin, progress and final ending. Concerning its first appearance in the military camps, it seems that it must be attributed not so much to their squalor and to their foul odors as, on the other hand, to the common vitiation of the air; for, since these fevers do not occur every year, their origin is in some sense to be ascribed to the peculiar constitution of an individual year. Although a moderate inclemency of the weather resulting from this fact does not of necessity have an evil influence, so far as concerns health, upon the inhabitants of the country, in the army, on the other hand, where that condition of affairs is constant, it is necessarily a fact that diseases of this sort are more easily initiated by evident causes, such as those errors in matters of hygiene that occur in considerable numbers. In the spring of this year the weather was almost continually rainy and humid, as a result of which the succeeding summer was hot, and contagious miasmatic fevers as a consequence were more virulent than before and produced so much more profound effects upon the bodies of those whom they attacked. Whereas this disease was indigenous to this region and existed at this time as an epidemic, it necessarily took its first origin in the army encamped in the neighborhood. The facts that it later became pestilential in character and epidemic in its extent and that it attacked many of the inhabitants of this neighborhood and killed not a few of them, were due to the bad condition of the air (which was less salubrious on account of the inclemency of the weather during this year) and especially to the exhalation of foul odors and to the intercourse with sickened soldiers from the camp. By continued extension it became more and more pernicious so that the miasmata of this fever, thus being spread abroad, increased powerfully and arose almost to the virulence of a pestilence. Diemerbrochius refers to a fever which broke out in this manner in a camp at Noviomagus in the summer time, and says that afterward another malignant and pestilential disease, and finally plague itself, appeared. Likewise this fever of ours, on account of its great contagiousness and the numbers of deaths which it cost, finally came to resemble in a certain measure the plague itself, in that the severest manifestations of involvement of the blood and nervous fluid complicated it in practically all cases. The rapid loss of strength, the feeble intermitting pulse, the formication, the eruption of papules and buboes,—all these pointed to coagulation and corrupt condition of the blood. Moreover the delirium, the mania, the inflammation of the brain, the torpor, the somnolence, the vertigo, the tremors, and the convulsive movements

showed lesions involving the head and especially the brain and nervous system.

These observations, as well as a considerable number of histories of those who suffered from it, are sufficient to distinguish this epidemic as a type of malignant fever.

The author is perhaps in the original version a little less dogmatic in his assertion that this disease was in reality a distinct clinical entity than would appear from the foregoing free translation of his expression of conviction; but present-day knowledge justifies the ascription to Willis of a more complete assurance in the matter of differential diagnosis than he may himself have intended to claim.

ARSPHENAMINE VS. NEO-ARSPHENAMINE, WITH A REPORT OF 1,609 INJECTIONS[1]

By EDWARD LESTER MERRITT, M.D.

Urologist to the Truesdale Hospital and Clinic, Fall River, Mass.
Formerly Lieutenant, Medical Corps, U. S. Naval Reserve Force

SYPHILIS since the World War and the publicity given the disease at that time continues to maintain a leading position in medicine. During the last few years the treatment of the disease has become more or less standardized, and today very few physicians place their confidence in the arsenicals alone. We have come to realize that the best results are obtained from using arsenic, mercury and the iodides in combination in the treatment of this obstinate disease.

It is not my intention in this paper to discuss the relative values of different methods of attacking the disease nor to touch upon the many newer products now passing through the experimental stage. However, of late there has been a great deal of discussion concerning the relative value of the older arsphenamine and the newer neo-arsphenamine. It is in regard to this discussion that I am presenting this paper.

This report covers a period of five years ending March 31, 1923, with a total of 1,609 injections administered to 373 individuals. Part of these injections were given at the U. S. Naval Hospital, Newport, R. I., during the war, and part in private practice. We realize that the deductions regarding the relative toxicity of the various brands and types cannot be considered conclusive because of the small number of each that was used.

For the sake of brevity I have classified all of the various salvarsans, arsenobenzols and arsphenamines under the heading of the newer term "Arsphenamine."

Of the 373 individuals treated, 63 were females and 310 were males. All of the drugs used in treating these patients were mixed and prepared for administration either by myself or under my direct supervision, and all injections were done by me personally. This is a distinct advantage in checking up results, as it can easily be seen that, when administered by several individuals, the difference in technique might account for the difference in results.

---

[1]Read before the Fall River Medical Society, April 25, 1923.

Having these patients in a hospital makes supervision easier. Of these 373 patients, 260 were under such observation. The remaining 113 seen in private practice did not have the same close supervision. The data secured from them was in the form of reports and not from direct observation.

Reactions may be divided into the following groups as arranged by Dr. Eichenlaub of Washington, D. C.:

1. Immediate table reactions, (*a*) nitroid crises which are acute anaphylactoid reactions occurring at the time of administration of the drug, (*b*) collapse resembling closely surgical shock.

2. Intermediate reactions. These come on from 2 to 48 hours after treatment, but usually within 12 hours. They consist of headache, nausea, vomiting, diarrhea, abdominal pain and perhaps chills. One may meet with all or any of these symptoms.

3. Late reactions, consisting of hemorrhagic encephalitis, which is very rare: (*a*) jaundice due to toxic hepatitis from arsenic (which reaction Stokes and Ruedman observed an increase of 1,000 per cent in their cases from 1918 to 1920); (*b*) rashes of erythema scarletinoides type due to poisoning of the skin with arsenic. Such rashes may vary from a mild erythema to a fatal exfoliating dermatitis.

It must be borne in mind that reactions in man are intimately connected with the large volume injected intravenously in the course of arsphenamine treatment. Neo-arsphenamine requires but about one-fifth to one-thirtieth the volume that is necessary in using arsphenamine.

All of the patients listed in this report received mercury and arsenicals, and most of them also received potassium iodide.

In the first series listed here, there were 448 injections of salvarsan of Metz administered to 110 patients, all of whom were males. The youngest was 16 years of age, the oldest 49. All of these men had either a positive Wassermann or dark field plus clinical evidence of infection. Twenty-eight had primary lesions, sixty-four had secondary lesions, and eighteen had tertiary lesions. The greatest number of injections administered to one individual was nine, the smallest number one. Of this total number of injections there was a reaction of some sort following 439. Nausea and headache followed 294; nausea and vomiting followed 94; nausea and vomiting together with a febrile reaction followed 51; no reaction whatever in only 9. The majority of these patients

showed the greatest reaction after the second and third injections. The dose at each treatment in these cases was 0.6.

The second series to be tabulated deals with 674 injections of arsenobenzol of the Dermatological Research Laboratories, Philadelphia, administered to 200 individuals. Of these 156 were males, and 44 were females. The youngest patient was 17 years of age, the oldest 59. Sixty-five showed a primary lesion, one patient having multiple chancres with a positive dark field from each lesion. One hundred and eighteen had secondary lesions, and seventeen had tertiary lesions. The greatest number of injections administered to one individual was thirteen, the smallest number one. One patient collapsed on the table but recovered. Two had dermatitis exfoliativa; one moderately, the other so extensively that he lost his entire epidermis, hair, eyelashes, fingernails and toenails. The peculiar part of this latter reaction was that it came on after the second injection, whereas, according to the literature on the subject, this type of reaction usually follows intensive treatment. The patient was in the hospital three months before he entirely recovered. Simple nausea followed 207 injections; nausea and headache followed 103; nausea and vomiting followed 117; nausea and vomiting and a febrile reaction followed 96. No reaction whatever followed 151. The dose in each of these injections was 0.6, the same as in the preceding series.

The third series deals with the arsphenamine distributed by the state of Massachusetts. This is given to physicians free of charge upon application. There were but 65 injections of this drug administered to 14 patients. Of this number 6 were females and 8 were males. The youngest was 11 years of age, the oldest 61. There were 36 injections administered to the females and 29 to the males. The first dose in each case was 0.4 and the others 0.6. Every injection was followed by severe nausea, vomiting, flushing of the face and conjunctivae and a febrile reaction.

This completes the total of arsphenamine injections with a total of 1,187 injections to 324 individuals. You will note that the number of injections followed by no reaction is very small, there being only 160 out of 1,187. All of these injections were given by the old gravity method in a dilution varying from 50 c.c. to 300 c.c. The treatment was given while the patient had an empty stomach, following a laxative the night before. The time for injection averaged six and a half minutes, and distilled water or sterile saline

as required was used in all of these injections. The patient was given the treatment while flat on his back, the arm extending out on to a small glass-topped table covered with a towel.

In the cases showing primary lesion the latter usually healed after the third or fourth treatment given on an average of eight days apart. The cases presenting secondary lesions usually cleared up clinically after the fifth injection. Although it was noted that in most all of the cases the Wassermann reaction became progressively weaker, no check was made on this, as I believe the continued clinical improvement is more important than the evidence obtained from the Wassermann reaction.

The next series deals with the product neo-arsphenamine of the D. R. L., Philadelphia, the only brand of this product used. There were 422 injections of this drug administered to 49 individuals. Of this number of patients 13 were females and 36 were males. The youngest female was 11 years of age, the oldest 58. The youngest male was 16 years of age, the oldest 59. Of these patients 11 had primary lesions, 26 had secondary lesions, 5 had tertiary lesions, and 7 were congenital syphilitics. In all of these cases the first injection was 0.3, the second and third 0.6, and the remainder 0.9, which dose equals 0.6 of the arsphenamine.

Simple nausea followed 164 injections, nausea, vomiting and a febrile reaction followed 47, and one had dermatitis exfoliativa to a very slight degree. No reaction whatever followed 210 injections. It is interesting to note that the patient developing the dermatitis exfoliativa was one of the two who two years before developed the same condition following the injection of 0.6 arsenobenzol.

All of the above injections were administered with a 10 c.c. Luer syringe, the patient sitting up with the arm extended on a small table. Distilled water was not used at all, the drug being mixed with sterile water only. The time of injection was never more than forty seconds, and many were given in less time than that when the veins were large and prominent. In this series not a single patient collapsed, in spite of the upright position and the short time of injection. Injections were given at all hours of the day, and it apparently made little difference whether or not the stomach was empty.

In all cases of primary or secondary lesions the patients showed marked improvement after the second injection, and all

lesions healed in practically the same length of time as under the arsphenamine.

CONCLUSIONS

1. Neo-arsphenamine is as valuable a therapeutic agent as arsphenamine.

2. A reaction of some sort, although often slight, is to be expected in from one-third to one-fifth of all injections.

3. Neo-arsphenamine is not as toxic as arsphenamine.

4. Neo-arsphenamine, because of the fact that it can be used in such small dilution, causes less shock to the patient and is thus more to be desired than arsphenamine.

264

THE MIGRATION OF A SHELL FRAGMENT FROM THE INFERIOR VENA CAVA TO RIGHT PULMONARY ARTERY—CASE REPORT

By ELLIOTT C. CUTLER, M.D., F.A.C.S.
Major, Medical Officers' Reserve Corps

(With one illustration)

THE SUBJECT of the migration of foreign bodies which is confined chiefly to fragments of military projectiles has been recently brought to date by Matas (3). It is a subject in which military surgeons have most experience and one that for many years has been of great interest to them, not only because of the bizarre nature of the course of these fragments but because of the light it throws on the tolerance of the circulatory apparatus to injury and partial block.

The case reported is that of R. C., Pvt., 1046821, Co. C, 21st Field Artillery. This man was wounded early in the afternoon of September 10, 1918, during the St. Mihiel offensive by a shell fragment. The fragment entered the right chest in the midaxillary line between the seventh and eighth ribs. Patient dressed by Major H. O. Wyneken at H. Q. 5th Division. He was there given A. T. S., 1,500 units, and at 5.25 p. m. morphia, grains ¼. At 11.50 p. m., September 10, 1918, he was admitted to Evacuation Hospital No. 3, Toul, France. Tag diagnosis—shell wound, right thorax. The man was in shock, slightly cyanotic, blood pressure 90/70, and was at once transferred to the shock ward. Treatment there consisted of the application of heat and the giving by rectum of one pint of a sodium bicarbonate glucose solution by the drop method. The patient remained in shock with an irregular, soft pulse, and at no time reached what was considered an operable condition or a condition justifying X-ray study. The missile was evidently retained. It seemed certain that there had been considerable loss of blood, but unless immediate operation could be performed transfusion seemed undesirable, as it was common experience that with thoracic wounds with a possibility of liver and abdominal involvement transfusion, unless followed by immediate operation permitting inspection of the source of hemorrhage, merely resulted in a subsequent loss of the transfused blood and even further depletion. The right chest cavity was dull, and the abdomen seemed more rigid on the right with suspicious dullness in the flanks. At 9 a. m., September 11, 1918, the condition of the patient was somewhat better, blood pressure 94/60. At 11 a. m. there had been no change in pressure, but operation

264

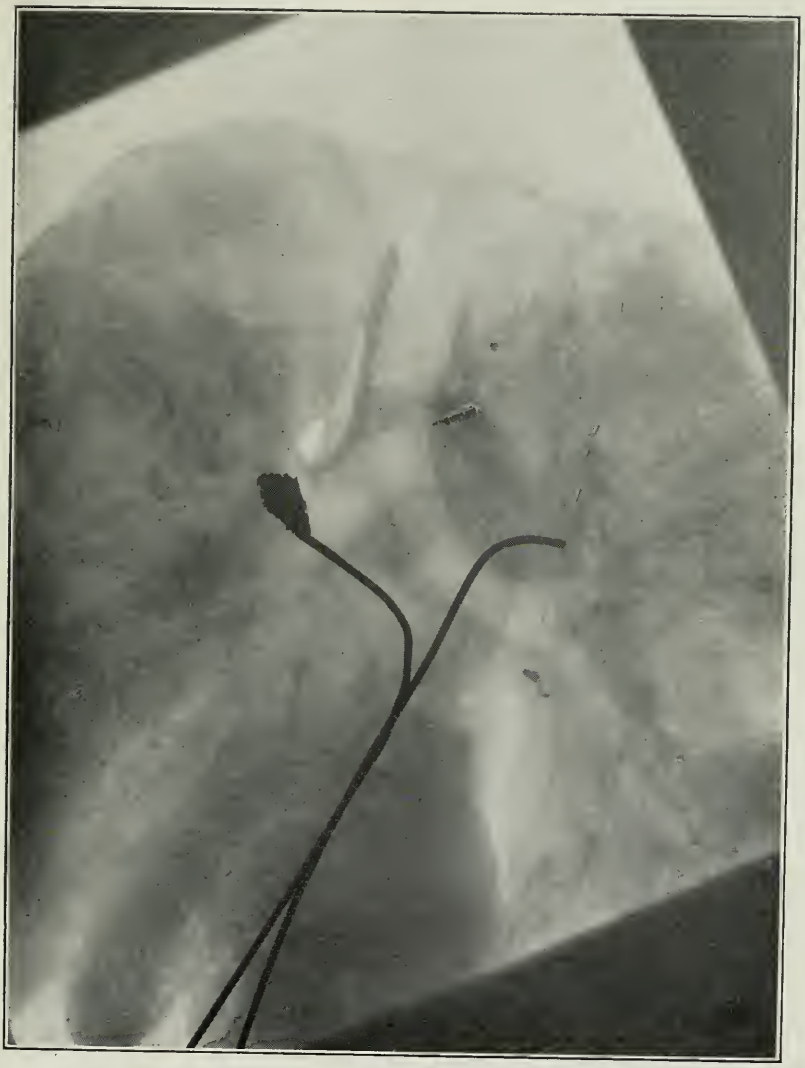


FIG. 1.—Roentgenogram of lungs with probes passing from the heart up into the pulmonary artery showing missile lodged in the first bifurcation of the right pulmonary artery.

To face page 264

was being considered when the patient's condition rapidly deteriorated and by 1.00 p. m. blood pressure was systolic, 58, and patient became markedly cyanotic. At 1.55 p. m. patient died.

Autopsy was performed the same afternoon by First Lieut. H. R. Livesay, M. C. Findings as follows:

Skin shows a light lemon tinge. Just anterior to right midaxillary line and between seventh and eighth ribs is a dark red, irregular, ragged penetrating wound 2 cm. in diameter. This wound extends downward, backward and inward.

Peritoneal cavity: The cavity is filled with dark red fluid and clotted blood.

Liver: On upper surface of the right lobe is a star-shaped laceration that admits the little finger; this leads downward, inward and backward. On the under surface of the liver, to the right of the neck of the gall bladder, is a ragged opening, 1.5 cm. in diameter. The inferior vena cava, 5 cm. below the lower border of liver, shows a ragged opening 1.5 cm. in diameter. Dark blood emerges from this opening. On dissection the posterior wall of the inferior vena cava shows a rounded laceration extending to the outer coats of the vessel.

Pleural cavity: The right cavity is distended with dark fluid and semi-fluid blood. Upper lobe of right lung is bound to chest wall by firm fibrous adhesions. Right parietal pleura between seventh and eighth ribs present a ragged laceration 2 cm. in diameter. Diaphragm corresponding to this area shows a perforated, ragged wound about 2 cm. in diameter.

Lungs: Right lung is bluish-red, slightly smaller than left, and shows less crepitation than left. Left lung is purplish-red, voluminous and crepitant throughout.

Heart: Apparently negative. On dissection of the pulmonary arteries there is found located at the first bifurcation of the right pulmonary artery an irregular fragment of shell about 1 cm. in its greatest diameter.

Anatomical diagnosis: (1) Hemorrhage (cause of death); (2) pulmonary embolism (shell fragment); (3) hemothorax; (4) hemoperitoneum; (5) shell fragment wound of thorax; (6) shell fragment wound of liver; (7) shell fragment wound of vena cava (inferior); (8) shell fragment wound of diaphragm; (9) pleural adhesions (right).

The lungs were then removed with the heart, the heart opened, and two malleable probes passed up the pulmonary artery and beyond its bifurcation. The accompanying X-ray reproduction (Fig. 1) graphically demonstrates the location of the fragment.

Such a case is of interest because of the distance traveled by the foreign body both before and after entering the circulatory system, and because of the relatively large size of the missile. But many even more bizarre cases are on record.

Three general classes of migration occur: (1) Where the missile enters the heart and is carried out into the peripheral arterial circulation where it lodges according to its size as the vessels narrow and there produces all the local signs and symptoms of an embolus; (2) where the missile enters the larger venous channels and is carried to or through the heart, lodging, as in the case reported, in the lung; (3) where there is retrograde migration, the missile entering either the heart or large venous trunks and then dropping back against the venous current to lodge at some point where again the caliber of the missile and vessel become the same.

O'Neill (4) and Baumgartner (1) report cases belonging to Class 1. In both instances missiles entered the left ventricle but were eventually recovered in the common iliac vessels. Baumgartner's case is of special interest, as the missile was recognized in the heart by the X-ray over a period of twenty days. Ten days after the second X-ray examination it was found lodged at the bifurcation of the right common iliac artery. Examples of cases of retrograde migration are not so common. One of the most interesting is that reported by Grandgérard (2). In this case the missile was located by the X-ray one week after the injury in the right auricle, substernal pain drawing attention to the case. A little over an hour later it was gone from the heart but was seen in the pelvis. Exploration revealed the missile in the internal iliac vein.

These cases are always of interest, and one continually wonders how patients survive such wounds. Cases in group one, where the missile enters the heart and progresses outwards with the blood stream, are certainly the more common. This is easily understood when one realizes the small chance any missile has, first, of penetrating a blood vessel, and next, if it does penetrate, of not perforating. The heart is large enough to catch and hold a missile, but it is well recognized that blood vessels, with their relative greater firmness of structure than the medium in which they lie and the ease with which they are dislocated to one side, offer a very poor target.

In the particular case cited it is interesting that the missile almost perforated the cava, a definite injury to the intima and even to the muscularis coat being found on the side opposite the wound of entry. Death, doubtless, was due to a combination of events, chiefly hemorrhage, but also probably to the pulmonary embolus, the time of occurrence of which we cannot prove but which may well have been the final factor in killing the patient.

BIBLIOGRAPHY

(1) Baumgartner, A.: Place due coeur par balle. Migration de la balle dans l'artère iliaque primitive. Extraction. Quérison. (par. M. le Dr. Perdoux). Bull. et mém. Soc. Chir., 1919, xlv, (1), pp. 632–637.

(2) Grandgérard: Migrations Rapides dans le Réseau Veineux d'une Balle de shrapnell Libre dans l'orseillette Droite. Paris Med., 1917, xxiii, pp. 48–49.

(3) Matas, R.: "Military Surgery of the Vascular System in Keen's Surgery," Vol. vii, pp. 714–717. W. B. Saunders Co., Philadelphia and London, 1921.

(4) O'Neill, C. S.: "Fragment of Shell in the Arterial Circulation." Brit. Med. Jour., 1917, ii, pp. 719–720.

ASSOCIATION NOTES

COMING MEETING AT CARLISLE BARRACKS, PA. OCTOBER 4-6, 1923

In response to inquiries regarding the question of accommodations during the period of the coming meeting at Carlisle Barracks, the following information has been furnished by Col. P. M. Ashburn, M. C., the present Commandant of the Medical Field Service School. Effective with the first of August, 1923, Col. Charles R. Reynolds, M. C., U. S. Army, will succeed Colonel Ashburn as Commandant of the school:

1. The accommodations for members of the Association at Medical Field Service School:

(*a*) Room, bed, bedding, towels, bedroom service and laundry, $0.50 per day.

(*b*) Mess and dining-room service, $1.50 per day; no rebate for meals missed.

Approximate cost of above to each member, $2.00 per day.

Bed rolls need not be brought, and either uniform or civilian clothes may be worn.

2. Following is a list of principal hotels at Carlisle and Harrisburg, and the prices quoted by each:

Hotel Carlisle:

Rooms without bath, single	$2.00
Rooms without bath, double	4.00
Rooms with bath, single	2.50
Rooms with bath, double	4.50 and up

Meals a la carte.

Hotel Argonne:

Rooms	$1.00
Rooms, with running water	1.50

Separate baths—Meals a la carte.

Hotel Wellington:

Rooms, single	$1.50 and $2.00
Rooms, double	2.50 and 3.00
Rooms with bath, single	2.50
Rooms with bath, double	3.50

Meals, American and a la carte.

Hotels—Harrisburg

Penn-Harris:

Rooms without bath	$2.50
Rooms with bath	$3.00, $3.50, $4.00

Meals a la carte.

Hotel Columbus:

Rooms without bath	$2.00 and $2.50
Rooms with bath	3.00 and 3.50

Meals a la carte.

Bolton Hotel:
European plan..... $2.00 to $3.50
American plan..... 4.00 to 5.50
Senate Hotel:
Rooms without bath..... $2.00
Rooms with bath..... 3.00

3. There are no housing accommodations available for the entertainment of lady members of the families of delegates at Carlisle Barracks. There is an officers' recreation room, however (Red Cross House), which can be used as a hostess house and placed at the disposal of visiting ladies during the period of the convention; simple lunches such as milk, coffee, sandwiches, small cakes, etc., can be served to them there by the Post Exchange.

4. It hardly seems feasible to attempt to publish a schedule of trains entering and leaving Harrisburg, as the number of them is so great and each man will have to look up his own, depending upon the part of the country from which he comes.

Following is a list of trains between Harrisburg and Carlisle:

Leave Harrisburg	*Arrive Carlisle*	*Leave Carlisle*	*Arrive Harrisburg*
4:45 A.M.....	5:33A.M.	2:37 A.M.....	3:10 A.M.
7:05.....	7:58	5:20.....	6:05
8:15.....	8:54	7:00.....	7:45
9:48.....	10:30	8:40.....	9:12
11:59.....	12:37 P.M.	10:45.....	11:20
3:23 P.M.....	4:03	12:46 P.M.....	1:25 P.M.
3:40.....	4:16	2:06.....	2:40
5:20.....	6:05	4:40.....	5:25
5:45.....	6:28	5:45.....	6:15
6:30.....	7:15	6:17.....	6:57
7:45.....	8:20	8:35.....	9:15
11:10.....	11:45	12:06 A.M.....	12:40 A.M.

It will be feasible to have Carlisle trains met by representatives of the post and to furnish transportation from the station in Carlisle to the post. It would not be feasible or necessary to attempt to run a bus line between the post and Harrisburg as the train schedules are good and in addition there is a trolley line between the two places, running cars hourly.

5. There will be a room available as the office and headquarters of the Association.

The tentative program, subject to possible change, is as follows:

Oct. 4: Preliminary Meeting, Reports, Demonstration of New Equipment of Medical Troops and Units, Demonstration of Medical Field Service School, Parade and Review, and Dedication of Bronze Tablet Commemorating the Services of the Officers, Nurses, Enlisted Men and Others who Served in the Medical Department During the World War; in the evening a Public Reception and Dance in the Gymnasium.

Oct. 5: All Day Demonstration of Lines of Medical Aid from the Firing Line back to and including the Field Hospital

Oct. 6: Final Meeting, Election of Officers, Presentation of Papers. Adjournment. Probably a visit to Gettysburg Battlefield.

COMMENT AND CRITICISM

CARBON MONOXIDE IN TOBACCO SMOKE

The much-mooted question as to whether the carbon monoxide present in tobacco smoke constitutes a hazard to the smoker in confined indoor spaces seems to have been settled as a result of tests just completed by the Department of the Interior at the experiment station of the Bureau of Mines at Pittsburgh, which demonstrated the danger to be negligible.

The tests, which were performed in the course of general studies of the Bureau of Mines relative to gas hazards in mines, were made on three men confined in a closed chamber whose dimensions were 1,000 cubic feet. The three subjects puffed merrily for the space of an hour and a half at cigarettes of every variety, Turkish, Egyptian, the old Virginia brand, and the type wherein the smoker "rolls his own." Following this, the smokers drew energetically at an infinite variety of cigars—cheroots, Pittsburgh stogies, black Manilas and Havanas of choice degree. Finally they puffed frantically at pipes, at pipes of clay and cob, at pipes of meerschaum and briar. At the conclusion of the performance the air of the closed chamber had become so smoky that it was impossible to see across the room. The atmosphere was so irritating to the eyes that it was necessary to wear goggles.

Samples of the atmosphere and blood samples of the smokers were then taken for analysis. It was found that in no instance did the carbon monoxide content of air exceed 1/100 per cent. The maximum blood saturation was 5 per cent. Some of the subjects supposedly inhaled their smoke, but the tests indicated that such inhalation, though it may have extended to the bronchial tubes, did not penetrate throughout the lungs. The tests indicate that carbon monoxide hazard from smoking indoors or in mines is negligible in itself, though the Bureau of Mines investigators consider that it may add to the smoker's hazard should he be caught by carbon monoxide from sources such as occur in the mining industry.

WHAT THE PUBLIC HEALTH SERVICE DOES FOR YOU

I. INTRODUCTION

Comparatively few persons think of the state governments as being a part of the United States Government. But of course they are. The Constitution distributed the governing powers be-

tween the federal and the state governments in such a way that the exercise by each of its share is almost imperative for the welfare of both. For either to be obliged to get along without the other would be almost as awkward as it would be to a man to be obliged to get along without one hand; he could learn to do it, of course, but he would have a lot of trouble in learning.

This division of authority applies in all fields of public work, including that of public health. Nearly every health activity in the country has both a national and a state end, which key into each other so intimately that it is often difficult to decide just how any given piece of health work could best be apportioned between the federal and state governments.

Theoretically, such a condition should result in disputes that would lead to nothing being done. But in practice the national authorities (U. S. Public Health Service) and the state health authorities have established so thorough an understanding that the problem becomes simple. For instance, a number of cities and the neighborhoods in several states recently wished to get rid of mosquitoes and malaria. By agreement the Public Health Service supplied skilled direction, and the states, counties, and cities supplied money and labor. The mosquitoes were promptly cleaned out with a great reduction in illness, deaths, and dictors' bills and a marked rise in comfort, attractiveness, production, real estate values, and population. Cooperation won the trick.

Similarly in nearly every phase of health work cooperation simplifies the tasks allotted by law.

Broadly speaking, the duties of the Public Health Service are to prevent disease from entering the country from abroad and from spreading from one state to another; to suppress epidemics, investigate diseases, disseminate health information, and attend to some others that are more or less incidental.

The most important of these tasks is the prevention of disease from entering the country and from spreading through it. Exclusion of disease (foreign quarantine) was once entirely in the hands of the states, but has gradually been surrendered by them to the federal authorities, who in the nature of things are much better equipped to manage it.

Prevention of the spread of disease (domestic quarantine) is two-sided: the Public Health Service has charge of the state to state spread of disease, and the states have charge of the spread within their respective borders. In practice, however, the nation and the

state officers cooperate freely whenever there is danger of an epidemic becoming especially serious.

Next in importance to disease control is the work of the Public Health Service in research—finding out things—in laboratory and in field and in disseminating information as to what has been found out.

Dissemination of health information is enormously important. Other countries, of course, disseminate it, but they do it chiefly for professional men, doctors, bacteriologists, and not until recently for the benefit of the "man of the street." The U. S. Public Health Service, on the other hand, addresses all the people. Some very technical publications are especially for the benefit of scientists, but by far the greater part of its publications deals with subjects that interest the everyday man—and with some that interest the everyday youth.

It disseminates information concerning new investigations, new discoveries and new methods, by means of printed books, newspaper articles, radio broadcasts, public lectures, demonstrations—and school children. Dissemination by children is very important, for when children learn a thing they can be relied upon to educate their parents.

The task of state health authorities, on the other hand, is to collect vital statistics (records of births, deaths, diseases, etc.); to prevent disease by vaccination, inoculation, and house quarantine of the sick; to supervise drinking water, milk, food, sewers, street sanitation, school sanitation, etc.; to inspect factories, workshops, etc.; and in some states to provide school nurses and school physicians.

Broadly spreading, the U. S. Public Health Service finds out things and the state and local health authorities apply them; though, of course, the state and local organizations find out a good many things and the Public Health Service applies a good many. Whichever way they work, however, they work together and get the maximum efficiency.

II. IF YOU ARE YOUNG

About twelve years ago the Public Health Service, finding that blindness among the new born was becoming unduly prevalent, issued a pamphlet bringing this condition to the attention of all physicians, and especially of all health officers, and urging them to make sure that the eyes of all new-born babies were cleansed with a certain simple chemical solution which had already been

made imperative by the laws of 28 states. Since then the Public Health Service, in common with the state and the local health authorities, has insistently urged every mother to lose no time in asking the doctor if he has attended to this matter and has thereby removed the great danger that menaces the sight of her new-born child. Such action is now required by law in every state in the Union; the sight of hundreds of children has been preserved. One of them might have been *you*.

The nation and the states likewise cooperated in forwarding birth registration. In 1915 the Census Bureau established the "birth registration area" for 10 states, the only ones in the United States that then kept birth records that were sufficiently reliable to be of real value. Since then the number of states in the birth registration area has grown to 30, containing 72.2 per cent of the total population of the United States.

Registration is extremely important to *you*. The Public Health Service has continually urged on mothers that they each ask the doctor if he has registered the birth of her child, as he is required to do by the laws of most states. But as birth registration is so modern it would be well for you to lose no time in finding out whether such a law was operating in your state when you were born and, if it was not, to take steps to have your birth registered. Such action puts on record your name, the names of your parents and the date of your birth. It thus shows when you may start to school, go to work, vote, get married without asking anybody's permission, make a will, control an inheritance, etc. It is also of value to the United States because, taken with all other births, it shows how fast the population is reproducing itself and how fast its different elements are increasing or decreasing.

That you survived through the first year of your life, especially if you were a "bottle" baby, may very well have been due to the work of the health services, federal and state, in continually preaching cleanliness, milk pasteurization, and other health protective measures. Chiefly by such work the death rate in the registration area of children under one year old has been reduced in the last twenty years from 162.2 (estimated) to 76 (1921), per thousand live births —that is, by more than one-half. The risk to bottle babies is estimated to be four times as great as it is for breast babies.

During the fiscal year ending July, 1922, the Service carried on child health work in ten states. In two selected counties in Florida, for instance, it investigated at the request of the Florida Board of Health and the Florida Federation of Women's Clubs the

causes of sickness and deaths among children and outlined ways by which the State Board of Health might reduce them. It organized nutrition classes, a dental clinic which cared for 75 children a week, freed from hookworm all children found infected, vaccinated all whose parents would permit it (vaccination of school children is not compulsory in Florida), established a permanent child health center, and in three months saw to the correction of one-third of the remediable physical defects found in the children in two large schools and brought two-thirds of the underweight children in a third school up to normal. Later, nutrition work was done in nine other counties in the state.

More or less similar work was done during the year in Missouri, Utah, and Mississippi, and at Bedford, Illinois; Hagerstown, Maryland, and Memphis, Tennessee. Later work was done in the District of Columbia, Virginia, and Maryland.

If you went to school in recent years or are still going you probably owe a very great debt to the health authorities, national and state. Following are some of the things that they do for you now and that they in some places began to do for you many years ago.

1. Made physical examinations to determine whether you had any physical defects that could be remedied while you were still young, but that if allowed to go too long untreated would handicap you for the rest of your life. Among such defects are (*a*) adenoids, which deform your face and clog your nose and make you a "mouth breather," with all the dangers that this entails; (*b*) defective eyesight, which hampers you at school—in playing baseball, if you are a boy, for you can't see the ball quickly, and in spoiling your looks, if you are a girl, and in scores of ways for both sexes in later life; (*c*) deafness, which prevents your understanding what the teacher says and causes you to be set down as disobedient or stupid; (*d*) decayed teeth, which prevent you from properly chewing and consequently from digesting your food, which in turn made you weak, sickly, "puny" and miserable.

All children suffering from these defects cannot be wholly restored to normal, but nine-tenths of them can be, and the others can be helped. For example, in a Vermont school 16 children far behind their classes and thought to be dull, sickly and stupid were treated for such defects, and all are now up with their classes, both mentally and physically, and some of them are among the leaders of the school.

2. At school, too, you were probably saved (though perhaps you

never knew it) from many an illness by the vigilance of the school nurse, who time and again sent home schoolmates of yours who were sickening with one or another sort of communicable diseases before they could pass it on to the others—among whom *you* were one.

3. At school, too, you were probably required to be vaccinated against smallpox, and perhaps to be inoculated against diphtheria and against typhoid. Smallpox would probably have been practically wiped out in the United States long ago had not the laws in some states been evaded. For a time nothing happened; but usually after three or four years, during which the unvaccinated population increased, somebody sickening with smallpox (though perhaps not knowing it) came to town, perhaps with his family, and started an epidemic among the unvaccinated. That is what happened a year or two ago in Denver and Kansas City, where smallpox caused 1,300 cases and 400 deaths, a very large proportion of the victims being young people.

Such things as those just cited above are commonly done for you in most of the wealthy and closely populated states and in the great cities by the state or local health authorities, but in many of the poorer and more sparsely populated states this is usually not the case, and in not a few states of intermediate resources conditions vary. In parts of the rural and thinly settled regions in nearly all states such work is sharply limited by the number of doctors and nurses who can be induced to leave the cities for the meager financial rewards of the country.

It is to meet just such conditions that the trained personnel of the U. S. Public Health Service is engaged in discovering the most pressing child health problems and in finding the most practical ways of dealing with them in view of the resources of each community.

III. WHEN YOU TRAVEL

Americans are great travelers; and special protection for them has recently been provided by health authorities, both federal and state.

Railway and Steamboat Travel.—No longer is polluted typhoid and dysentery breeding water allowed to be dipped from any creek or river, pool, or other source to be put into the "coolers" on railway trains or passenger boats. Not long ago such practices were chronic disease spreaders; now the Public Health Service will not permit any interstate commerce railroad or river or lake

carrier to use any drinking or cooking water whose source has not been investigated and found satisfactory; and most states will not permit any carriers operating entirely within the state and therefore not subject to national authority to do so. Up to June 30 last 3,030 sources for railways had been examined, of which 1,379 had been "certified" as satisfactory. For vessels 362 had been inspected and 90 "certified." Without such inspection a total of 1,923 unsatisfactory sources would still be used as sources of drinking water.

Automobile Travel.—If you travel in an automobile to the great national parks that lie in the western part of the country, you will find the Public Health Service and the Forestry Service keeping close watch on the sanitation of hotels and automobile camps and insisting that you and all tourists shall leave them unpolluted and thus safe for the coming of other tourists.

Travel of Communicable-Disease Patients.—Would you like to find beside you in the train a child that had, say, measles, or a disease even more serious? On the other hand, would you wish to deny that child the right to get back to its home, where it could be lovingly cared for? Up to a few years ago either or both of these things happened, and they may still happen over a large part of the country, particularly the part west of the Mississippi River.

Until recently the national laws related only to persons suffering from one of the five great plague diseases (plague, typhus, cholera, smallpox and yellow fever); and the state law differed in almost every state. Now the national and state health authorities and the transportation agencies have prepared a standard sanitary code which has been adopted by many states and will probably soon be adopted by most of them. This code forbids persons afflicted with the great plague diseases from traveling at all, but it permits sufferers from all other diseases to travel under conditions that will prevent them from being a menace to the health of other passengers but are yet not so hard as to incite sufferers to try to evade them and thus nullify the purpose for which the code was adopted.

Travel by Rail or Steamship Employees.—All "travelers" do not travel by railroad nor even by river or lake steamboats. And all travelers do not travel merely as an incident of their lives. Some 3,000,000 persons in the United States travel as employees of the passenger or freight transportation service, at home or on the high seas.

These employees on railroad trains have the same health protection that passengers do, but those who "go down to the sea in

ships" on American documented vessels or who serve as members of the coastguard, keepers of lighthouses, or who in other ways help to keep the flag on the seas have much more.

A century and a quarter ago Congress established the Public Health Service (under the name "Marine Hospital Service") chiefly in order to provide medical and surgical care to American seamen. For eighty years seamen were required to pay 20 cents a month for this. In 1878 this tax was doubled, but in 1888 it was abolished, and since then all service has been free. A little more than a year ago a service was established by which sailors on American ships at sea might obtain medical advice by calling up a marine hospital by radio. During the last year advice has been given in regard to appendicitis, asthma, cramps, earache, eye injuries, heart disease, hernia, hiccoughs, influenza, infected teeth, malaria, opium poisoning, ptomaine poisoning, and swallowing broken glass. Many of the diagnoses were made on board ship; others were made by Service doctors ashore, sometimes after interchange of several messages. For instance, queries as to reports of cramps among the crew, and later more cramps and worse cramps, finally elicited the information that all the sick ate at a single mess. This known, treatment and prevention were definitely outlined. In some cases, in addition to emergency treatment advice, information as to the nearest marine hospital is sent and preparation made for operation or other treatment at the earliest possible moment.

IV. PROTECTS YOU FROM COMMUNICABLE DISEASES

Of course, all health work in a sense protects you against disease, but some phases of it do so much more directly than others.

Foreign Quarantine.—Most important of the direct work is that of barring foreign diseases from our shores. This was almost the first duty undertaken by the Public Health Service, which was organized 125 years ago under the name of the Marine Hospital Service and charged with the medical and surgical care of merchant seamen. Owing to this duty it was usually the first to discover any disease brought from abroad. From this the Quarantine Service of the U. S. Public Health Service developed.

The states of course had control of their ports, and at first most of them established their own quarantines. Later, however, it became evident that the National Government was best fitted for carrying out such work, and one after another the states turned over their stations to the Public Health Service. New York, the last, fell in line about two years ago.

Some years ago the quarantine work of the Service was divided into two parts, foreign and domestic. Foreign quarantine has to do with diseases coming from abroad and domestic quarantine with the spread of disease among the states.

The Public Health Service has two lines on defense against foreign diseases, one abroad and the other at home. In all, 77 officers man the first line: 31 in Europe, 2 in South America, 7 in Mexico, 3 in China, 19 in the Philippines and Hawaii, and 15 in Cuba, Porto Rico, the Virgin Islands, and Panama. These officers are stationed at as many seaports, where they are charged with preventing the sailing for America of emigrants infected with diseases, especially with typhus, cholera, plague, and yellow fever.

In Europe the task has of late not been easy. The would-be emigrants were mad to get to the United States, their native countries were for the most part glad to have them go, and some of the steamships were not averse to carrying them but were averse to spending money for delousing plants, etc. The Public Health Service could not directly compel them to do this, nor could it everywhere do it itself, for some European countries objected on the ground that in setting up the necessary facilities the United States was encroaching on their sovereignty.

The Public Health Service had to counter by requesting the State Department to instruct its consuls in Europe to refuse a bill of health to vessels sailing for the United States with passengers who had not been subjected to cleansing measures and by instructing its own quarantine officers to delouse immigrants on arrival in this country and to detain them, in case of suspicion, for twelve days thereafter. Only by this action were some steamship companies induced to install disinfecting plants abroad. Aided by the present restrictive immigration law and by the disinfecting and delousing facilities, conditions are now reasonably satisfactory. The restrictive law is, however, until July 1, 1924, only, and unless it is renewed or in some way replaced the tidal wave of immigrants waiting in Europe for the letting down of the bars will rush for this country at the first opportunity and the resulting pressure will test every timber in the health barricade.

Domestic Quarantine.—A task almost as important as keeping out foreign diseases is that of preventing diseases from spreading from state to state.

The law lays this last duty upon the Public Health Service, with the proviso that it is to be done, so far as possible, by using state machinery. How necessary such use may be is shown by the fact

that a year or two ago the Public Health Service representative in one mid-west state was called upon in a single year to check 23 epidemics (13 of them serious), 9 of typhoid, 1 of gastro-enteritis, 1 of measles, 5 of smallpox, 4 of scarlet fever, and 3 of diphtheria. The total patients from these numbered 1,644.

The Public Health Service has not the force to place a sanitary representative in each state, but it has met the problem by establishing seven sanitary districts, in each of which there is a sanitary engineer. In addition it has adopted the policy of building up in every State Health Department of a strong "division of communicable diseases." Such are now operating in several states. In these, as in all others, however, the Public Health Service stands ready to help whenever called upon by the state health officers.

For twenty-three years the Public Health Service has been fighting hard to prevent the spread of bubonic plague from the foci in California and later in Texas, Louisiana, and in a few individual ports. Plague is spread by the bites of fleas that live on rats and are carried by them on ships to all parts of the world. The work against plague consists in fumigating ships to destroy, as nearly as possible, all rats on board; in preventing surviving rats if any from getting ashore (in bales or crates or by walking the mooring ropes); and in rat-proofing all buildings, particularly those in seacoast cities, so that even if plague rats do get ashore they will not find there a sufficient number of rats to propagate the disease. To do all this is not easy; but the Public Health Service, the state authorities and the seaport cities on the Atlantic, Gulf, and Pacific coasts all joined wholeheartedly in the fight, and the march of the disease has been stayed. The last outbreak of plague in man in the United States (that along the Gulf coast) took altogether thirty lives in 1919 and 1920, but since then there have been no human cases.

Besides the plague, the Public Health Service was called upon last year to fight typhus, which for years has ravaged Europe, killing thousands. The disease was brought from Mexico by Navajo Indians who carried infected body lice, and it quickly became rife on the reservation in New Mexico. It was eradicated by the Public Health Service after it had killed 25 Indians and 2 white men.

Last year, smallpox caused 132 deaths at Kansas City; 24 deaths at Poteau, Okla.; 50 cases (no deaths) at Hickory, Mo.; but yielded to vaccination. Anthrax, imported on horsehair and appearing in 17 states, was not allowed to spread. Infantile paralysis broke

out in Idaho, causing 15 deaths, mostly of young children, and in Washington, causing 15 more deaths.

Venereal Diseases.—The methods by which the Public Health Service and state authorities prevent travelers already ill with communicable diseases from transmitting them to other passengers have already been described (see part III, "What the Public Health Service Does for You when You Travel").

The army records of the physical examinations made in connection with the "draft" showed for the first time how generally the people, especially the young men, of the country were infected with venereal diseases, and led to the creation by Congress of a special division of the Public Health Service to control and ultimately to eradicate them. The attack has taken two main forms: (1) A wide educational campaign informing the country of the nature and of the consequences of the diseases to both the infected and the innocent; (2) cooperation with the states in the case of those infected, the Public Health Service alloting from a federal appropriation for this work a certain amount of money, dependent on population, for establishing clinics and other venereal disease control measures in states that set aside an equal amount. There are 542 such clinics now in operation.

Malaria.—Malaria is very widespread in the United States. It is a serious problem in fourteen states, most of them large and all of them contiguous. Every consideration of common-sense indicated cooperative action against the disease; and the work in 13 out of the 14 states interested is today carried on by the Public Health Service in cooperation with the State Health authorities and the International Health Board. By their steady and unremitting labors the malaria area (or malaria mosquito area) is being steadily reduced. Communities were freed from the disease in 45 places in 1920, in 26 in 1921, and 96 in 1922. The U. S. Public Health Service directs the work from a headquarters established at Memphis, Tenn. (see also Part I. Introduction).

Leprosy.—According to the best estimates there are now in the United States 500 to 1,500 lepers, a mere bagatelle compared with those suffering from tuberculosis, which is for that matter far more contagious and far more deadly. Nevertheless, knowledge of the presence of a leper in a street car, for instance, would cause a panic, and that of a tuberculosis patient could cause scarcely a thrill.

Public opinion has insisted that the Federal Government shall take charge of all lepers, and it has undertaken to do so.

In 1917, Congress provided for a national home for lepers to be

administered by the Public Health Service, but so strongly did the various states object to its location within their borders that it was not until four years later that the Service was able to acquire a leper home (in Louisiana). This home is still being enlarged, and each new ward is rapidly filled. The Public Health Service, on application from a proper state authority, may accept as a patient at this home any leper found in any state, with the exception of aliens subject to deportation from the country. This protects you in steadily increasing measure against possible contact with lepers who are at large.

Leprosy has been found in a measure amenable to treatment. Nearly one-third of the patients at stations in Hawaii have been released as being no longer a menace to public health, and of these only about one-eighth have relapsed.

V. BY SOLVING INTERSTATE HEALTH PROBLEMS

Of great importance to both city and country is the solution of the health problems connected with drinking water. Up to fifty and even to twenty-five years ago (depending on the progress of settlement in the United States) few creeks and rivers were so overloaded with industrial and sewage pollution as to be unable to purify themselves by natural processes within a few miles, the actual distance depending on various conditions.

All this is changed. The ground about many surface wells and the rock strata from which many deeper wells draw their supply have been so permeated with pollution that any water that has filtered through such soil or strata has become dangerous; many lovely sparkling creeks obtain some of their water from farm or village cesspools; and most rivers carry waters which cities on their banks do not dare to drink untreated. Water is also polluted by wastes from huge industrial plants. Oyster beds and bathing beaches on the seacoast have been so polluted by city sewage that some of them have had to be abandoned.

All this gave rise to an entirely new set of problems which had to be solved in order to protect the health of both city and country dwellers. How well these problems have been and are being solved appears from the fact that the death rate from typhoid fever in 57 United States cities has been reduced in thirteen years (1910 to 1922, inclusive) from 19.59 to 3.15 per hundred thousand. Unfortunately the decrease in the rural regions has not been anything like so great. In spite of a great campaign of education the farmer has not yet learned to locate his well properly with

regard to his privy. For this reason drinking water is much more apt to be polluted with disease germs in the country than it is in the city.

Some of these problems are of course largely state problems to be met by state laws. But, from its very nature, running water in the United States must be largely an interstate problem which can best be handled by federal authorities in cooperation with the states.

Many years ago the Public Health Service began to study water supplies in connection with the suppression of typhoid fever outbreaks for which its aid was invited. Its experience with these led it strongly to advocate the use of sanitary privies in unsewered regions and the handling of human excreta in such ways that it should not pollute wells. Some years later this was extended to the sewerage problems of single houses and of small communities. Later the question of river pollution by city sewage became acute, and one of the earliest investigations undertaken by the Service was that of sewage pollution of interstate waters in the Great Lake regions and in the Missouri River and Potomac River watersheds. This showed what the problem was and what unless controlled it must sooner or later become—something that until then had not been realized.

At about the same time, the Service took up the task of investigating disease-breeding pollution, due to both sewage and industrial wastes, in oyster beds along the United States seacoasts. Its findings, when applied by the states interested, resulted in preserving many oyster beds and bathing beaches by making them safe against pollution.

The Service next took up the subject of industrial wastes. In the preceding fifty years, industrial plants, once comparatively few, had increased in numbers enormously and (up to about ten years ago) had in most states unhesitatingly discharged into creek or rivers wastes from chemicals used in paper making, tanning, bleaching, etc., to say nothing of the rotting remains from canning vegetables. Nearly all of such wastes were harmful, and some of them were actually poisonous.

The problem was to find how a given industry could be continued and at the same time the health of those dependent on the stream for drinking water could be protected. The problem was largely specific—that is, it differed with the wastes from each form of industry.

Besides establishing many general principles the Service has

worked out methods by which wastes from strawboard, tannery, creamery, tomato canning, and other factories can be so handled or utilized that they will be rendered harmless. It showed how the thing could be done, and many factories forthwith voluntarily instituted measures to treat their sewage and wastes. Those that did not act of their own accord were in some states required to do so by the state health authorities.

The Public Health Service has divided the United States into seven sanitary districts. In each district a sanitary engineer supervises the water supplies used by interstate carriers and cooperates with the state health authorities in the certification of drinking waters used on railway trains and river and lake steamboats (see Part III, "What the Public Health Service Does for You when You Travel").

They also assist in solving the protection of city water supplies "before they are built" by helping in the selection of sites or by pointing out by what criterions they should be selected and how they could best be protected from pollution; and they do similar work in regard to sewage plants. They report everything of value that may develop to the Service, which publishes and disseminates it for general information.

Last year, in the New England district alone, such work was done in cooperation with the states on 32 public water supplies—3 in New Hampshire, 1 in Vermont, 7 in Maine, where also plans for the abatement of two sewage disposal nuisances were prepared, and 21 in Connecticut. Similar work was done in each of the other Service districts.

The Public Health Service in cooperation with the states has assured clean drinking water to travelers (see Part III).

Pure Medicine.—When you or one of your family is ill, you want them to have reliable medicines; and not so many years ago these were not always obtainable, for money-hungry manufacturers did not hesitate to adulterate both drugs and food. Later the National Government adopted a pure food and drug law that applied to shipments across state lines, and a number of states adopted similar laws that applied inside their own boundaries, and these together met the evil fairly well. Since then, however, conditions have changed. When these laws were adopted most medicines were chemical substances which were prepared by machinery and whose purity and strength could easily be regulated and readily tested. Of late, however, preventive medicines (vaccines, antitoxins, and serums) have come into great vogue; and the prepara-

tion of these and of certain arsenical preparations (such as salvarsan) require great technical skill and knowledge. Moreover, all of them (except the salvarsan group) are obtained through the reactions of animals, and their strength varies markedly with the individual animals used. It follows that before these "biological products" can be intelligently administered to a patient they must be standardized—brought to a fixed strength. To do this requires a separate test for every lot produced by a manufacturer.

Some years ago Congress assigned to the Treasury Department operating through Hygienic Laboratory of the Public Health Service the duty of making these tests and of inspecting the factories where these "products" were manufactured: No bacteriological product may be shipped in interstate commerce not bearing the indorsement of the laboratory. This indorsement is, of course, not as to the medicinal value of the product but is merely as to its strength, toxic properties, and the sanitary conditions under which it is manufactured.

Most states have officially adopted the Public Health Service standards, but some still allow the manufacture within their border of products whose manufacturers are unwilling to submit them for testing or their factories for inspection. Such products may not be shipped from state to state.

The Public Health Service has standardized products for use against diphtheria, lockjaw, dysentery, meningitis, pneumonia, and typhoid.

Within the last twenty years the death rate from diseases now treated by bacteriological products has been enormously reduced. Smallpox, except where vaccination has been neglected, has been almost abolished; meninginitis to about one-sixth and diphtheria to less than one-third; rabies, if taken in time, can almost always be prevented; tetanus has been greatly reduced.

Rural Health Work.—County-wide rural health work was in progress in 1922 in 56 counties in 16 different states, in each at the request of the state health authorities. In such work the U. S. Public Health Service cooperates with the state and county health organizations and supplies a part of the money; volunteer residents, especially women, do much of the detailed work. In the cooperative projects the sanitary conditions are enormously improved, the dairies are protected against flies and other evils, polluted wells are closed or cleaned and protected against further pollution, the health of the school children is greatly improved and their minor physical defects remedied, infant and maternity hygiene

is promoted, and clinics, usually dental, tuberculosis, or venereal disease control, are opened.

In Madison County, Ala., when this work was begun in 1918, the yearly death rate, which for ten years had averaged 19 per 1,000 residents, began to drop and reached 12.6 in three years after rural hygiene work was begun. This means that, besides an enormous improvement in the general health, the number of residents of the county who now die each year is less by 350 than the number who died each year before rural health work was started.

Similar work has been done in different parts of the United States since 1911; and 105 counties in 24 states have received or are still receiving the benefit of the Public Health Service health system of rural hygiene.

VI. IF YOU ARE AN INDUSTRIAL WORKER

Industrial workers are commonly divided, according to the nature of their work, into manufacturing and mechanical, about 31 per cent; transportation about 7.5 per cent, mining about 2.5 per cent, and farming about 26 per cent. Taken together these constitute about two-thirds of all persons in the United States who are "engaged in gainful occupations."

The health of the farmer group has been considered with that of other country dwellers (Parts II, IV, V) and the transportation group with other travelers (Part III). The health of the manufacturing and mechanical and of the mining groups, which together number about 13,000,000, remains to be considered.

The great majority of workers are employed in factories and therefore, under our present-day system, necessarily live in or close to the cities and are therefore subject to the risks and enjoy the benefits of city life. In addition, however, they are subject to certain "occupational" hazards and diseases to which other city residents are not ordinarily exposed to so great an extent. Some factory workers, for instance, are exposed to skin diseases caused by irritating substances contained in the articles with which they work. Others are exposed to the "heat hazards" that go with "hot jobs" in iron foundries, for instance, and others again to tuberculosis, to which they have been "pre-disposed" by breathing in minute dust particles that have injured their lungs. How to prevent or reduce such hazards and such diseases is the problem that the Public Health Service is continually facing.

Among the tasks which it has completed within the last three years is that of discovering the causes of lead poisoning in pot-

teries; of the high prevalence of tuberculosis in a large grinding and polishing factory that was typical of many more; and of skin diseases among printers, zinc oxide workers, and others who use cutting oils or lubricating compounds. It has also studied and devised means of mitigating the effects of gasoline fumes on those exposed to them, of carbon monoxide gas in closed garages and elsewhere, and of poor illumination on the eyes and the general health of post-office workers; and has sought for a safe cyanide gas for fumigating. These problems, all of which were solved more or less satisfactorily, were important to the health of thousands of workers.

The following are typical of many minor discomforts that are being continually remedied:

In one plant where khaki cloth was made up, a boy who carried bales of cloth on his shoulders complained that the dust from the bales had given him eczema; and a very large number of women stitchers, whose duties compelled them to handle and sew the cloth continuously, were suffering from inflammation of the membranes of the eyes. Analysis of the dust by the Public Health Service showed that it contained a large percentage of chrome yellow and sulphur dioxide, and the trouble was promptly rectified.

In another plant, where a thousand men were working on machines where they were exposed to large amounts of "cutting" oils, about a fourth were suffering from eruptions and other skin troubles. Simple methods of preparing for work and of cleaning up afterward resulted in a marked decrease in the number affected.

The establishment of medical departments in most of the industrial plants of the country was also in part due to the Public Health Service. Such departments attend not only to employees who are injured in accidents or who are taken sick at the plant but they also investigate the causes of any disease that breaks out in the plant and eradicate it, thereby making the factory more healthful and reducing absenteeism and the cost of finding new men to replace those who quit. They keep records, too, from which the Public Health Service may work out, as soon as enough are available, a health standard based on the normal or average amount of absence from work on account of sickness. Such a standard is expected to bring about important improvements in factories that find themselves below par.

The effect on the physique and health of industrial workers, especially women, resulting from the monotonous and rapid repetition, hour after hour and month after month, of movements in

themselves light and simple is now being investigated by the Public Health Service.

So far, though conclusive proof is lacking, it seems probable that serious injury may be caused by any work the performance of which calls for cramped, constrained, or awkward posture. Less certain is the effect of such work on the nervous system. That the constant repetition of a movement does in time affect this system is more than probable, but how importantly it affects it has not been established. This investigation will almost certainly result in great benefits to working women.

UNITS OF ORGANIZED RESERVES

The following list of units of the Organized Reserves were authorized by the Surgeon General on the dates shown:

General Hospital No. 8, N. Y. Post-Graduate Medical School and Hospital, April 20, 1923.

Veterinary Convalescent Hospital No. 2, Fifth Corps Area, April 27, 1923.

General Hospital No. 28, Christian Church Hospital, Kansas City, Mo., May 24, 1923.

General Hospital No. 61, Latter-Day Saints Hospital, Salt Lake City, Utah, June 7, 1923.

General Hospital No. 62, St. Luke's Hospital, Jacksonville, Fla., June 28, 1923.

LEPROSY AMENABLE TO TREATMENT

Leprosy is in a measure amenable to treatment, says the U. S. Public Health Service. During the last ten years (1912–21) a considerable percentage of the lepers segregated at the Kalihi Hospital near Honolulu and on Molokai Island have been paroled; that is, they have been released as being "not a menace to the public health," but have been required to report for examination at certain intervals which vary with the individual case. Of those paroled about 13 per cent have relapsed and have returned to segregation, but about one-fourth of these were later paroled for the second time. In all, 242 lepers were paroled; 31 relapsed and seven of these were later paroled. Ten were completely released from parole.

The chance of arresting the disease decreased with the length of time that it had been allowed to go without treatment unless this period was seven years or more. Apparently patients who survive without treatment for seven years possess powers of resistance that slightly increase their chances for marked improvement under treatment.

Those who desire it are treated with chaulmoogra oil and its derivatives.

The parole system was begun in 1912 and has worked admirably. Those paroled appear to have told their friends that the conditions existing at the hospital were good; and the mere fact that they had been released has shown that segregation might lead to cure and not to lifelong confinement, as it almost invariably did previous to 1912. As a consequence many lepers, instead of concealing the disease up to the last possible moment (and thereby spreading it through the community) are now surrendering of their own accord and taking treatment. This earlier surrender and earlier treatment hasten the degree of improvement that will secure parole and will later, perhaps, complete release. About 70 per cent of those who have been paroled were in segregation for less than two years.

AN APPRECIATION

To the Editor of "The Military Surgeon":

Three score "Knights of the Caduceus," representative Reserved Medical Officers from the Second Corps Area, assembled at Carlisle Barracks, Pa., July 7, in response to an order directing them to report to the Medical Department Field School, U. S. Army, for a fifteen-day tour of active duty.

The school was a great success and amply justified the Medical Department in its selection of Carlisle as the place for similar annual camps of the Medical Reserve Corps.

The basic instruction was along the four lines of activity, in one of which a medical officer would be called upon to function in the event of his taking the field, i.e., (1) The regimental medical detachment, regimental surgeon; (2) Sanitary Company, including sanitary inspector; (3) Ambulance Company; (4) Field Hospital Company.

We were divided into four groups; three days were devoted to each section, studying its organization, equipment and function. R. O. T. C. medical students, who were also at Carlisle Barracks taking their six weeks practical field course, acted as the personnel for the several units under the supervision of officers of the Army Medical Corps detailed for the purpose on account of special study given to the several components of the Medical Regiment, formerly known as the Sanitary Train.

Each Friday these units marched out some 5 miles into the country northwest of Carlisle, simulated battle conditions as nearly

as possible by setting up their dressing and collecting stations in the field, and demonstrated the evacuation of the wounded from front to rear in a most realistic manner.

In addition the course consisted of practical demonstrations in camp and field sanitation; an opportunity to inspect new Medical Department equipment and portable field laboratories; lectures on sanitary tactics; map reading and problems.

The "High Water Mark" was reached on Sunday, July 15, when all hands were taken in ambulances to Gettysburg and there on the battlefield was given by competent authority a vivid description of that great engagement and all realized what strides had been made by the Medical Department since that memorable July, '63.

All present felt the fortnight well spent at Carlisle and that the Government had made a profitable investment in organizing a Medical Reserve Officers' Camp on an active duty status.

Hearty thanks of appreciation were unanimously expressed to Colonel Ashburn and his efficient staff for their untiring efforts in making our tour of duty both pleasant and profitable.

Gentlemen, you succeeded.

HAROLD DUNCAN COCHRANE, M.D.,
Major, Medical Officers' Reserve Corps,
1156 Madison Avenue, Albany, N. Y.

July 27, 1923.

BOOK REVIEWS

THE NATURE OF MATTER AND ELECTRICITY, An Outline of Modern Views: By Daniel F. Comstock, S.B., Ph.D., Engineer and Associate Professor of Theoretical Physics in the Massachusetts Institute of Technology, and Leonard T. Troland, S.B., A.M., Ph.D., Instructor in Harvard University. Third Printing. Illustrated. 8°, 203 pp. New York: D. Van Nostrand Company, 1921.

The last few years have seen a tremendous advance in the knowledge brought to light by science of the ultimate constitution of matter. This new knowledge reveals to us that matter is of "extraordinary complexity and delicacy of structure." The word "advance" in the first sentence is to be construed very literally, for, after all, earlier theories have been found to be not so much wrong as insufficient. By the same token we may assume that the future holds in store "advances" equally momentous concerning the "nature of matter and electricity."

All matter is composed of minute particles known as "atoms" and still smaller particles denominated "electrons." Atoms have a tendency to group themselves into "molecules." The relations which exist in size between atoms and molecules are approximately these:

Hydrogen atom	=	1
Uranium atom	=	approximately 3
Sugar molecule	=	approximately 6
Starch molecule	=	approximately 59

Certain individual facts regarding atoms are set forth in Chapter III of the book here under review:

"Size.—Atoms are minute particles each about one three-hundred-millionth of an inch in diameter. If the earth were made up of baseballs it would be a fair model of a drop of water made up of atoms. The most powerful microscope known, used under the best conditions, would enable us to see an object approximately two hundred atoms in width. Single atoms are, therefore, totally invisible, and their properties cannot be found out by direct inspection.

"Shape.—Not much is known as regards the shape of the atoms, but in general they behave as if they were not very far from spherical.

"Different Kinds.—We are now acquainted with about one hundred different kinds of atoms, that is, different species. The individual atoms in each species are, however, exactly alike, or have so nearly the same properties that under most conditions there is no difference in the action of the individuals. Atoms of different kinds differ in size and still more in weight.

"At present there is no agreement as to the difference in size of the various kinds of atoms. On the basis of certain calculations from coefficients of expansion, some investigators believe that the sizes of the different kinds of atoms are in the same order as their weights. According to this view, therefore, the lightest atom, hydrogen, is also the smallest; and the heaviest atom, uranium, is also the largest. The atom of uranium is about 240 times as heavy as the atom of hydrogen, whereas it has only about two and one-

half times as great a diameter. If this view is correct, we might represent an atom of hydrogen by a wooden ball the size of a pea, and an atom of uranium by a lead ball the size of a cherry. Representatives of all of the other atomic species would then be arranged in a complete series from the small wooden ball to the large lead one.

"Although the individual atoms of one kind are, with certain modern reservations, all alike, those of different species have decidedly different properties, and this difference in property is what gives variety to the physical world as we see it. The atoms of one species are so definite, unique, and characteristic in their actions and properties that they give one the impression of a delicacy and complexity of structure suggestive, almost, of the complexity of personality. There are subtle resemblances between one species and another with regard to one property, and marked differences with regard to another. Hence one should be very careful to realize that when, for reasons of analogy, we represent an atom as a ball of wood or a ball of lead we are representing it only in the vaguest general way, and are totally ignoring its complexity and individuality."

Molecules as well as their smaller constituent parts are all ultramicroscopic. The size and relationship existing between the largest molecule and the smallest particle visible to any microscope available today is represented by the ratio of 1:32.

The simplicity of a molecule of water, for example, as compared with some of the more complex organic molecules is well indicated by a comparison of their empirical formulae.

$$H_2O = \text{Water}$$
$$C_{49}\ H_{32}\ N_6\ Na_3\ S_2\ O_{11} = \text{an azo-dye}$$

The number of molecules in one gram-molecular weight of any compound is equal to 6.06×10^{23}, which is known as "Avogadro's number."

Concerning the electron it is stated that "so far as we know all electrons are exactly alike. In this respect, therefore, they differ greatly from atoms, which, it will be remembered, exist in about a hundred varieties.

"Size.—In size the electron is very much smaller than the atom. The exact size is not known but it has a diameter of about one one-hundred-thousandth that of an atom. This means that if the average atom be represented by a sphere one hundred yards in diameter, the electron, on the same scale, would be about the size of a pin-head. In other words, a large office building is not large enough to represent an atom if a pin-head is to represent an electron.

"Weight.—The electron is much lighter than any known atom although in proportion to its size it is much heavier. Although the atom is enormously larger than the electron, the lightest atom, namely that of hydrogen, is only about two thousand times as heavy as an electron. A short calculation shows, therefore, that the 'density' of the electron is a million million times that of the atom. The minuteness of the electron may seem almost incredible, but careful research leads almost inevitably to the conclusions stated, and the scientist must report what he finds.

"Shape and Structure.—Practically nothing is known as to the shape or structure of the electron. There are indications, however, that it is spherical in shape and symmetrical in every way."

Following these descriptions the author proceeds to a discussion of "Electrons, chemical action, and light," "Electrons and magnetism," "Radio-activity," "The structure of the atom," "Recent discoveries concerning atomic structure and radiation," and "Atoms and Life."

Part II of the book consists of an appendix containing 56 sections in each of which is discussed in greater detail some individual problem that has been treated in more elementary fashion in Part I. The captions of these individual sections are as follows: "The sources of the modern theory of matter," "Methods of determining atomic sizes," "Atoms, colloids and the microscope," "The shape of atoms," "Species of atoms; atomic weights, and atomic volumes," "The periodic table of the elements," "The arrangement of the atoms in the molecule," "The physical properties of compound substances," "Concerning chemical equations," "The forces of attraction within bodies," "The kinetic molecular theory," "The speeds of molecular motion," "The average distance traversed by a gas molecule between impacts," "Diffusion," "Sound," "Latent heats," "The 'critical' and boiling points of liquids," "The simple laws of gases and of solutions," "Osmotic pressure," "Heat conduction," "The Brownian movement and its measurement," "The solid and crystalline states," "Vapor pressure and the law of distribution of molecular speeds," "Heat energy and specific heats," "The discovery and measurement of the electron," "The importance of electrical forces in nature," "The reactions of electrons and charged atoms," "Some effects connected with the electrical current," "Electrical conduction in gases and liquids," "The electrical transmission of power." "Thermo-electricity," "Chemical affinity," "Solution and electrical decomposition," "Chemical valency," "Chemical action," "Effects and conditions of chemical change," "Light waves and lines of electrical force," "The Zeeman effect," "The conditions under which light is produced," "The gamut of electrical waves," "Color and the absorption and reflection of light," "The refraction of light," "Rowland's experiment," "The deflection of moving electrons by a magnet," "All bodies are magnetic," "The radio-active substances," "How the rays from radium are studied," "How Rutherford proved the Alpha rays to be helium atoms," "The nature of the gamma rays," "The energy of the atom," "The radio-activity of potassium," "Inorganic evolution," "Theories of the structure of the atom," "The quantum theory of radiant energy," "X-rays and their measurement," "Life and catalysis."

The dual arrangement of this book previously indicated is an ingenious method of reaching two classes of readers. The subject is so simply discussed in the eleven chapters constituting the first part of the volume that its text might well serve as collateral reading for high school students essaying their first steps in the field of physical chemistry. Part II, on the other hand, contains enough technical description and scientific detail to engage and hold the attention of the physicist and the chemist. It need not be said to be understood that this little volume will afford the man or the woman of general culture who wishes to maintain contact with the advances in all fields of human knowledge an opportunity to acquire a broad comprehension of the new concepts in physical chemistry with a minimum of time and effort.

A. N. Tasker.

NON-SURGICAL DRAINAGE OF THE GALL TRACT, a Treatise concerned with the diagnosis and treatment of certain diseases of the biliary and allied systems, in their relation to gastro-enterology and general clinical medicine; by B. B. Vincent Lyon, A.B., M.D., Chief of Clinic, gastro-intestinal department of the Jefferson Hospital; associate in medicine in the Jefferson Medical College; attending physician (formerly pathologist) to the Methodist Episcopal Hospital, Philadelphia. Illustrated with 175 engravings and 10 colored plates. 8°, 640 pp. Philadelphia and New York: Lea & Febiger, 1923.

Many of the important modern advances in medical knowledge have been predicated upon the discovery and application of new methods of examination. Among these it is sufficient to mention the ophthalmoscope, the cystoscope, the stomach tube, the sphygmomanometer, the polygraph, and the electrocardiograph. To this list must be added the most recent of all—namely, the non-surgical transduodenal drainage of the biliary tract. The development of this diagnostic and therapeutic measure has advanced tremendously the possibilities in connection with these two features of gall-bladder disease, and the present volume which treats with such rich detail all aspects of the pathology of the biliary system is very timely. The technic of the measure that serves as the focal point for the book here under review is as follows:

"Step 1. Patients present themselves at the office at 8 to 9 a. m. on a twelve-hour fasting stomach following a motor test meal, which includes a meat sandwich (any kind of meat or fowl desired), and either six stewed prunes or about twenty raisins. With this meal the patient may drink any simple beverage, but after its completion nothing further is to pass the lips until after Step 2. On the morning of the examination the patient is not allowed to brush the teeth.

"Step 2. Attempted disinfection of the mouth as follows:

"(a) Thoroughly rinse and gargle mouth with a mild astringent solution containing zinc chloride and formalin.

"(b) Thoroughly rinse and gargle with 1: 500 solution of potassium permanganate (1 grain to the ounce).

"(c) Thoroughly rinse and gargle again with the astringent solution.

"(d) Thoroughly rinse and gargle with sterile water.

"*Note.* In cases having nasal catarrh, rhinitis, or nasopharyngitis it is a good plan to spray and disinfect the nares as effectually as possible.

"Step 3. A freshly sterilized duodenal tube is swallowed and passed to the greater curvature, i.e., the first mark on the duodenal tube should be placed at 55 cm., which in the average case closely approximates the distance between the lips and the greater curvature of the stomach. During this step it is well to note and record whether the tube was taken easily, without nervousness, or coughing, or the development of a gag reflex, inasmuch as these occurrences modify in certain directions the proper interpretation of the fasting gastric residuum due to biliary regurgitation.

"*Note.* In patients in whom one wishes to limit the study chiefly to the more accurate determination of the bacteriology of the duodenum and gall-tract, I find it advisable before passing the sterile tube to attempt the 'disinfection' of the esophagus by having the patient swallow 100 c.c. of a 1 to

1,000 solution of potassium manganate or of freshly prepared silvol, and after this pass the duodenal tube and drain out or aspirate by syringe as much of this solution as possible before proceeding to wash the stomach. Having made use of this step it is obviously impossible to make any accurate study of the chemistry of the fasting gastric juice.

"Step 4. The fasting gastric residuum is extracted by gravity or by syringe aspiration into a conical graduated glass vessel. Its amount, its color, and its gross consistency and characteristics should be carefully noted and recorded. In addition to the total amount the relative proportion of the sediment to the supernatant fluid contents should be independently recorded. The sediment is then examined microscopically in fresh preparations stained and unstained, and the filtrate is tested for free and total acids, and both filtrate and sediment tested for the presence of occult blood with guaiac and benzidene.

"Step 5. The stomach is now thoroughly washed, astringed and disinfected.

"(a) Washing the Gastric Mucosa. This is done by repeated douching with and withdrawal of 250 c.c. units of sterile water at body temperature and continued until the wash water is returned sparkling clear. Attention is paid to the notes recorded of the number of 250 c.c. units required to clean off the surface slime on the gastric mucosa; of the amount and general gross characteristics of the mucus flocculations recovered; of the occurrence of biliary regurgitation during washing; of the recovery of part or all of each unit given; and of a determination of the 'tonus' of the stomach and the proper functioning of the pyloric sphincter.

"(b) Astringing the Gastric Mucosa. This is done by introducing 250 c.c. units of sterile warm water to which has been added 15 to 25 c.c. of the zinc chloride-formalin solution. This solution is withdrawn and the gastric mucosa is subsequently washed and rewashed until the returned water is again sparkling clear.

"(c) 'Disinfection' of the Gastric Mucosa. This is accomplished by washing the gastric mucosa with a 250 c.c. unit of freshly prepared silvol or potassium permanganate or mercurochrome in a solution of 1 to 5,000. This is withdrawn and the stomach is again washed and rewashed with sterile water until the final 250 c.c. unit is sparkling clear and contains no visible flocculent particles.

"It is to be remembered that the whole purpose of this attempt at cleansing and disinfecting the mouth, nasopharynx, esophagus and stomach is to get rid of annoying and disturbing elements leading to misinterpretation when the tube has reached the duodenum and is recovering materials from the duodeno-gall-tract.

"Step 6. We now inject 4 oz. of sterile water through the tube in order to supply the stomach with a fluid to be emptied into the duodenum, and thus encourage gastric peristalsis to assist the tube into the duodenum. The proximal end of the tube is clamped off, the patient lies down on a bed or couch, turns well on the right side assuming the right Sims' position, and thereafter *very slowly* swallows the tube to the duodenal mark (75 cm. from the lips), taking at least twenty minutes by the watch to swallow this 20 cm. of additional tubing. It should be noted that this 4 oz. of sterile water is introduced *through* the tube and is not to be swallowed by the patient,

thereby avoiding washing esophageal debris into the stomach. It is also of fundamental importance to impress upon the patient the necessity of *great care directed against consciously swallowing any saliva.* Patients should be provided with a clean enamel spitting dish or pus pan which they must use for this purpose. The total amount of saliva secreted and spat out during the examination is recorded and in many cases studied, for certain diagnostic inferences can be secured from attention to this detail.

"Step 7. Tests for position of tube.

"(a) Test the material obtained by aspiration with dimethylaminoazobenzol. If no free HCl is present the tip is *probably* in the duodenum, except in cases of achylia gastrica when this test is of no value.

"(b) Connect a 1-ounce syringe to tube and inject air in quick spurts, and at the same time listen with a stethoscope placed over the *exposed* epigastrium. If the sound is heard over a considerable area with the point of maximum intensity to the left of the midline, and approximately as much water or air can be withdrawn as was injected, the tip of the tube is most probably in the stomach. If the sound is localized to the right hypochondrium, but no peristaltic bubbling or crepitant sounds are set in vibration, and no air can be withdrawn, the tip is probably in the grip of the antrum pylori, but has not passed through. If the sound is sharply localized in its maximum intensity to the right hypochondrium, and peristaltic crepitant sounds are set up by the injection of air, and only small fractions of air can be withdrawn, the tip is probably in the duodenum. This is the most reliable clinical test for the position of the duodenal tip. Fluoroscopic visualization comes first in accuracy, but all of us are not supplied with roentgen-ray aid in our office or hospital work, and it is well to develop clinical tests upon which we can rely.

"If the tube has not entered the duodenum it must be pulled out as far as the stomach mark and again slowly reswallowed.

"Step 8. Having determined the position of the tip to be in the duodenum a little air is injected to balloon out the duodenal walls and thus avoid trauma when *gentle* suction is exerted on the syringe. The duodenal fluid is lifted out and laid aside for study. If bile stained material is obtained before stimulation with magnesium sulphate, it is obvious that the common duct sphincter is open and part or all of the 'A' or common duct bile has escaped, and cannot be differentially figured on.

"Step 9. The gall-bladder is stimulated to evacuation of its fluid contents by instilling into the duodenum 75 c.c. of 33 per cent volumetric solution of magnesium sulphate at body temperature. This percentage is actually equivalent to a 16.66 per cent solution of magnesium sulphate. This solution is run in by gravity through the barrel of the syringe. The end of the tube is pinched to hold its syphonage and then attached to a drainage bottle. Suction by bulb or syringe is not applied unless fluid does not run out under gravity syphonage (under a pressure head of 18 to 24 inches), and then only by a 1-ounce bulb.

"Step 10. When bile begins to flow past the 'window' in the tube the collection bottle is changed and subsequent alterations in the gross appearance of the bile are followed by changing the collection bottle. The interpretation of the first bile obtained depends upon biliary regurgitation observed during Step 5 and the condition of Oddi's sphincter as determined under

Step 8. If bile has been obtained at either of these two points, the first bile obtained after stimulation with magnesium sulphate is probably 'C' bile.

"Step 11. If the bile stops flowing or no 'B' bile is obtained, the patient is restimulated one or more times depending upon the amount of magnesium sulphate solution that has been retained. I make it a rule not to exceed at any one treatment 90 c.c. of the 33 per cent volumetric solution of magnesium sulphate being retained by the patient. This is equivalent to 1 ounce of a saturated solution of this salt, which is an average high dose when given by the mouth, and this dose should not be exceeded in the duodenum on account of its depressant action and its tendency to relax tonus of the entire intestinal tract, giving rise to an uncomfortable sense of distention and tympanites. My usual dosage is as follows: First stimulation 75 c.c. of 33 per cent solution and recover as much as possible; second stimulation 60 c.c. of 33 per cent solution; third stimulation 45 c.c. of 33 per cent solution; fourth stimulation 30 c.c. of 33 per cent solution, taking care as seen above that the total amount unrecovered and, thus retained by the patient, does not exceed 90 c.c. of the 33 per cent solution.

"Step 12. Cultures are made as desired from any bile sample. For gall-bladder culturation the best material is afforded by the last of the 'B' bile (the dregs from the floor of the gall-bladder). This is theoretically so, but is practically difficult of accomplishment. Cultures are taken directly into either glucose bouillon (Rockefeller formula) or Hormone broth (Huntoon formula) in special 'fool-proof' flasks devised by Dr. Richardson.

"Step 13. *Microscopy of Bile.* The various specimens of bile should be examined microscopically within fifteen to thirty minutes after their withdrawal, special attention being directed toward their cellular elements, bacteria, mucus and crystals.

"Step 14. When no further bile is being obtained or the drainage session is to be stopped, a fresh solution of silvol 1 to 5,000 (using 10 c.c. of a 1 to 500 solution added to 90 c.c. of sterile water) is instilled into the duodenum and immediately withdrawn by syphonage. Amounts up to 75 per cent of this are usually obtained, but only rarely is the entire amount recovered.

"Step 15. The patient now sits up and is given a duodenal enema consisting of 250 c.c. of Ringer's solution at body temperature. This should be run in slowly by the drip method in not less than twenty minutes. This may be reinforced by adding from ¼ to 1 teaspoonful of the crystals of sodium sulphate as may be necessary to secure 2 to 4 fluid intestinal evacuations within three hours following the drainage. The amount of sodium sulphate to be added to the Ringer's solution will depend upon the amount of the magnesium sulphate previously used and retained by the patient, and upon the average response of the individual patient to saline cathartics.

"Step 16. *Withdrawal of the Tube.* On completing the duodenal enema a little air is injected to free the metal tip by ballooning out the duodenal wall, and the tube gently but evenly withdrawn. Momentary obstruction may be encountered at the pylorus, at the cardia and at the glottis. At the first two points, or elsewhere except at the glottis, injecting a little air will release the obstruction. The retention of the tip of the tube at the glottis is promptly overcome by the patient swallowing simultaneously as the tip is withdrawn.

"Step 17. The patient is given a pleasant mouth wash to rinse the mouth,

and is then given a cup of beef broth and a few crackers. He is then permitted to go home and may often go about his business, but is encouraged to rest as quietly as possible. The total duration of this treatment averages two and a half to three hours. Where *liver* drainage is an essential in treatment the tube is left in and drainage continued for a longer period up to about six hours."

Numerous illustrations serve to interpret the printed text. Each chapter is concluded by a carefully selected and well-rounded bibliography. The final section of 140 pages is given over entirely to reports of cases, an index of authors, and a general index. This volume registers a milestone in the development of our knowledge concerning diseases of the digestive system in general and of the biliary tract in particular.

A. N. Tasker.

Practical Anatomy, an Exposition of the Facts of Gross Anatomy from the Topographical Standpoint and a Guide to the Dissection of the Human Body; by John C. Heisler, M.D., Professor of Anatomy in the University of Pennsylvania, with 366 illustrations, of which 225 are in color, by E. F. Faber, 3rd Ed., enlarged. 8°, 792 pp., lxiv l. Philadelphia and London: J. B. Lippincott Co., 1923.

While Dr. Heisler's work on "Practical Anatomy" is essentially a guide to the dissection of the human body, it partakes, nevertheless, in some measure of the characteristics of a textbook on anatomy. In particular does it give detailed consideration to the "surface anatomy" before an actual description of the parts to be uncovered by dissection is entered upon.

This work is essentially an American production, and the author has not hesitated to depart from the lines of procedure laid down in works emanating from the older European schools. Thus it is urged that the cadaver when brought into the dissecting room be first placed in the lithotomy position, and that dissection of the perineum be proceeded with immediately in order that it may be completed "while the parts are still fresh and while their relations are as yet undisturbed by work upon adjacent regions." Again, the blood vessels and the nerves are studied twice—once in connection with the dissection of the individual regions of the body and again by themselves as separate systems.

The volume is rich in illustrations. These, with a few exceptions, are not reproductions of actual photographs, but are diagrammatic and schematic in their nature. As such they serve better the purposes of the student who stands by the dissecting table than actual photographic reproductions would do. A valuable feature of the printed text consists in the bold facing of key words in each sentence. By this the attention of the student is caught and focussed upon the individual structure which he must find and identify.

The contents of the book and the order of its arrangement are indicated as follows:

THE UPPER LIMB

a. The back and the scapular region.
b. The pectoral region and the axilla.
c. The shoulder region.
d. The arm.

e. The region of the elbow.
f. The anterior surface of the forearm.
g. The palmar or volar surfaces of the wrist and hand.
h. The dorsal surface of the forearm, wrist and hand.
i. The articulations of the upper limb.

THE LOWER LIMB

a. The gluteal region.
b. The posterior surface of the thigh and the popliteal space.
c. The anterior surface of the thigh.
d. The surface anatomy of the lower part of the thigh and knee.
e. The region of the knee.
f. The hip joint.
g. The anterior surface of the leg.
h. The dorsum of the foot.
i. The posterior aspect of the leg.
j. The sole of the foot.
k. The articulation of the lower limbs.

THE HEAD AND NECK

a. The scalp.
b. The antero-lateral region of the neck.
c. The face.
d. The dissection of the contents of the orbit.
e. The ear.
f. The pharynx and the cervical portion of the oesophagus.
g. The mouth cavity.
h. The nasal fossae.
i. The larynx.
j. The prevertebral muscles.
k. The joints of the spinal column.
l. The articulation of the spine with the skull.
m. The costo-vertebral articulations.
n. The dissection of the brain.
o. The telencephalon or cerebral hemispheres.
p. The surface of the cerebrum.
q. The diencephalon.
r. The mid-brain.
s. The metencephalon.
t. The myelencephalon or medulla oblongata.
u. The dissection of the eyeball.

THE ABDOMEN AND THORAX

a. The male perineum.
b. The female perineum.
c. The dorsal surface of the trunk.
d. The spinal canal.
e. The anterior abdominal wall.
f. The male external genitalia.
g. The abdominal cavity.
h. The posterior abdominal wall.
i. The male pelvis.

j. The female pelvis.
k. The thorax.

THE ARTERIAL SYSTEM
a. The arteries of the trunk and head.
b. The systemic aorta.

THE VENOUS SYSTEM
a. The cardinal system of veins.
b. The inferior caval system of veins.
c. The portal system of veins.

THE PERIPHERAL NERVOUS SYSTEM
a. The cranial nerves.
b. The spinal nerves.

THE SYMPATHETIC SYSTEM

A. N. Tasker.

A Key to the Electrocardiogram; by Louis Faugeres Bishop, M.A., M.D., Sc.D., F.A.C.P., Professor of the Heart and Circulatory Diseases, Fordham Univ. School of Medicine, New York City; Consulting Cardiologist to the Lincoln Hospital; Fellow of the New York Academy of Medicine; member of the American Medical Association, of the Medical Veterans of the World War, of the American Therapeutic Society, of the New York Pathological Society, of the Society for the Prevention and Relief of Heart Disease, and of the Alumni Association, St. Luke's Hospital; author of "Arteriosclerosis," "Heart Disease, Blood Pressure and the Nauheim Treatment," and "Heart Troubles, Their Prevention and Relief." Illustrated. 8°, 96 pp. New York: William Wood Company, 1923.

Through the introduction of electrocardiography (and in a less measure of sphygmography) specialist students of the heart have come to realize that cardiac diagnosis was led into many and devious errors by reliance upon the older methods of inspection, palpation, percussion and auscultation. An impressive comparison between the results of auscultation and those secured through electrocardiographic study of the heart is given by the author in his preface in the following words: "The heart is shut up in the chest and is therefore not subject to inspection. In like manner a frog may be shut up in a box. Now suppose four wise men were seated around this box with the frog inside, and each, with his ear close to the box, was listening to the frog to see if he could determine which legs the frog was moving or what he was doing. One wise man might say: 'I hear a scratching sound and I believe the frog has moved his right front leg'; another might venture, 'I heard a loud thud and I am sure the frog has kicked his left hind leg'; and the third man might assert that he heard a general scratching and pounding sound and believed the frog was moving all four legs. After retiring to an adjoining room for an hour or more to debate and discuss the matter of which legs the frog moved, the wise men would have reached no definite conclusion as to just what the frog had been doing in the box. Now suppose these same men returned to the room where the frog was shut up in the box and attached a piece of string to each of the frog's legs, and, after labeling the strings as to which leg each was tied to, they hung the strings outside the box. They could now determine by watching the strings just exactly what the frog was doing with his limbs. Later on, assume they discovered

that each time the frog moved a limb the contraction of that muscle generated a current of electricity of a type peculiar to that particular limb. If a wire was attached to the frog and if the little electric currents which were generated when the limbs moved were collected, it would be possible, by studying these currents to find out which muscles the frog was using when he moved his limbs. If we substitute the human heart for the frog these things which have just been mentioned have actually been accomplished. Each muscle bundle of the heart as it contracts, generates its own particular electric current. These currents are collected by wires attached to the limbs of the person under examination, and the currents are sorted out and studied by passing them through a fine filament between the poles of a powerful magnet. The filament sways back and forth according to the quality of the current passing through it. The shadow of the string is photographed on a moving film, and when printed, an exact picture of the activity of the heart under examination is obtained."

The fundamental principle of electrocardiography was discovered when Galvani observed, two hundred years ago, that the leg muscles of a dead frog could be made to move through stimulation by electrical discharge. Still later it was shown that not only could muscular contraction be produced by an electrical current, but that each individual contraction of the muscle generated an electrical current. Not all parts of any individual muscle contract at exactly the same time, and since, briefly, fibers in contraction have a higher potential than those which are still relaxed, a current flows from the former to the latter. But since, then, each muscular movement produces an electrical current, it follows that every systolic contraction of the heart determines the generation of an electric current. It is the study and graphic representation of these currents that constitute the science of electrocardiography.

Certain frequent inquiries as to the fundamentals in the technique of examination of the heart by this method are answered by the author before he actually proceeds to description and discussion of the method itself: "Since the heart lies obliquely in the body the distribution of the currents given off is not symmetrical, but is always recorded from the arms and left leg. From here, wires lead to the string of the galvanometer, between the magnets. The wires carry the heart currents and the currents deflect the wire. The two wires at any time leading to the string of the instrument are called 'a Lead.' The question is often asked as to why, in making electrocardiographic tracings, the wires are attached to both arms and to only the left leg. The reason for this is that the apex of the heart points toward the left in regard to the trunk, so that the best lines for observation of the differences of potential are: (1) across the top of the heart, between the two arms; (2) the axis of the heart, between the right arm and left leg; (3) the left side of the heart, between the left arm and left leg. If the right leg were used the line between the right arm and right leg would not cross the heart at all, neither would an observation from a line taken from one leg to the other directly cross the heart. In those rare cases of transposition of viscera where the heart points to the right, we naturally take our observations with leads which correspond to the altered position. Another inquiry which is often made is why it is necessary to have three leads, and in what way the leads differ. It should be stated that different parts of the heart

attain different degrees of potential during the beat. The leads are as follows:

Lead I . . . . . Current from right arm and left arm;
Lead II . . . . . Current from right arm and left leg;
Lead III . . . . . Current from left arm and left leg.

"In the normal individual the three leads have somewhat different values. There is, however, a considerable latitude of variation in the waves of all the leads without going outside the limits of the normal, so that we can repeat that no hard and fast rule can be laid down as to what is a 'normal' electrocardiogram. The curve must be normal for the individual when all clinical data are duty considered."

A very valuable feature of this book is the simplicity of the language in which its descriptions are set forth. From that point of view, it is especially valuable for the medical student and for the physician who approaches the subject for the first time. It is illustrated with reproductions of electrocardiograms, made from all possible sorts of cardiac disorder. These, in each instance, are the most typical of their kind and are so labelled and explained as to allow a rapid and impressive comparison between them. The complete scope of the book is indicated by a list of the captions of the individual chapters:

Use of graphic methods and history of the electrocardiograph.
The electric autograph of the heart of a healthy person.
The time element in the electrocardiogram.
Sinus arrhythmia.
Heart block; instances in which the ventricle acts abnormally after the auricle.
Complete heart block; instances in which the auricle and ventricle act independently of each other.
Premature contractions; instances in which the auricle or the ventricle acts out of time.
Simple paroxysmal tachycardia.
Auricular flutter; instances of very rapid action of the auricle.
Auricular fibrillation; instances of trembling paralysis of the auricle.
Alternation of the pulse.
The effect of valvular disease on the heart as shown by the electrocardiogram.
Lesions in the right bundle branch.
The electrocardiogram as showing relative activity between the right and left sides of the heart.
Practical value of the electrocardiogram.

APPENDIX

The practical employment of the electrocardiograph.
The setting up of an electrocardiographic machine.
Running the machine.
Correct operation of running the machine with the patient connected.

A. N. TASKER.

ANÆSTHETICS IN PRACTICE AND THEORY, A Textbook for Practitioners and Students, by J. Blomfield, O.B.E., M.D. (Cantab.), Senior Anæsthetist to St. George's Hospital and Lecturer on Anæsthetics to the Medical School. 8°, 424 pp. Chicago: Chicago Medical Book Co., 1923. Price, $7.50.

A very complete and detailed treatise on the whole subject of anæsthesia—general, local and regional. In the first chapter, which is introductory and historical in character, the author shows that "The history of attempts to produce unconsciousness as an aid to surgery begins hundreds of years ago." Such ancient writings as the Bible, the Talmud, and Homer's "Odyssey" all contain references to the use of drugs for the alleviation of pain. In none of these is such therapeutic application suggested for the purpose of controlling surgical suffering, but in the works of Dioscorides (first century of the present era), recommendations as to the use of these drugs to combat operative pain are found. The root and leaves of the mandrake and Indian hemp were much in vogue then and in later centuries for this purpose. A thousand years later an Italian, Theodoric, prescribed a "flavour" composed of opium, mulberry, hyoscyamus, hemlock, mandragora, and other plants. This flavor was applied on a sponge held at the nostrils of a patient who was undergoing surgical interference. The amount of real analgesia thus secured must have been pretty shadowy. In the seventeenth century the cervical vessels were compressed with the idea of producing unconsciousness through cerebral anæmia. Pressure on large nerve trunks was also made use of to produce local neurasthenia in the extremities, and it is stated that "John Hunter amputated a leg with the aid of this form of anæsthesia." Hypnotism is shown to be "a powerful but uncertain method of producing anæsthesia." Reference is made to the hypnonarcosis of Friedlander which consists in the combination of anæsthesia and hypnotism.

The scope of the work and the general subjects with which it deals may be envisaged from consideration of the captions by which the individual chapters are indicated:

I. Introductory and Historical.
II. Definition and Nature of Anæsthesia.
III. Physical and Chemical Nature of General Anæsthetics.
IV. Physiological Action of Anæsthetics.
V. Physiological Action of Anæsthetics Separately Considered — Chloroform.
VI. Physiological Action of Ether.
VII. Physiological Effects of Nitrous Oxide, Ethyl Chloride, and some less commonly used Anæsthetics; also of Mixtures—Specific Anæsthetic Effect of Nitrous Oxide.
VIII. Administration of Anæsthetics.
IX. Administration of Ether and of Ethanesal.
X. Administration of Nitrous Oxide.
XI. Administration of Chloroform.
XII. Administration of Ethyl Chloride.
XIII. Mixtures and Combinations of Anæsthetics.
XIV. Less Commonly Used Anæsthetics.
XV. The Choice of Anæsthetic.
XVI. The Preliminary Use of Narcotic and other Drugs.
XVII. The Posture of the Patient and Its Bearing on Anæsthesia.
XVIII. Undesirable Conditions of the Patient during Anæsthesia; their Causation and Treatment.
XIX. Accidents and Complications that may follow Anæsthesia.
XX. Unusual Uses of Anæsthesia.

XXI. Local Analgesia.
XXII. Spinal Analgesia and Sacral Analgesia.
XXIII. The Fatalities of Anæsthesia.

A. N. Tasker.

Chirurgie Vasculaire Conservatrice; Technique—Indications Operatoires et résultats, by P. Moure, Chirurgien des Hôpitaux de Paris. Preface de Ch. Lenormant. 8°, 179 pp. Masson et Cie, Editeurs, Paris, 1923.

This book constitutes a very complete exposition of present-day plastic surgery of the blood vessels and of the results secured thereby. This phase of general surgery has been of slow development as such; for a long time it appeared to remain the particular property of certain operators who had specialized in it. Recent wars, however, have familiarized surgeons with vascular surgery and with its difficulties and dangers; and if it does not yet seem that the time is entirely ripe when plastic operations on the blood vessels may everywhere and always supplant the older classical methods, nevertheless there are great numbers of cases in which such surgery presents immense advantages.

To secure such results as ought to be derived therefrom, vascular surgery should not contain any element of improvisation. Before undertaking it an operator should be thoroughly familiar with both its instrumentation and technique, and—a point of particular importance—he should have studied it experimentally.

Surgeons will find in this monograph (which has in reality no analogue), a very complete summary of the indications, limits, results, and advantages of plastic surgery of the blood vessels. Its author has devoted himself to a study of blood vessel suture and of transplantation of these structures for considerably more than a decade. His first work along this line was in the surgical laboratory, whence he transferred his activities to the operating room. It is safe to say that no other French surgeon has contributed more to this new branch of surgery which appears to have so wonderful a future before it.

In the first part of the volume there is described the technique of blood vessel suture in its different modalities. Its end results are critically examined and its technique is explained under the following captions:

A. Circular and lateral sutures of the arteries and veins.

B. Blood vessel anastomoses.

C. Blood vessel grafting.

In the second part the author has studied the indications for vascular suture in his application to human surgery and treats successively of:

A. The treatment of recent wounds of the arterial and venous trunks.

B. The plastic surgery of arterio-venous aneurisms of traumatic origin, and of those which have their cause in pathological processes. (This chapter contains a study of the partial occlusion of arteries by encircling aluminum bands and a description of the aneurysmorrhaphy of Matas.)

C. Arteriotomy in arterial embolism and thrombus.

D. Vascular anastomoses.

E. Blood vessel grafting.

F. The methods of examination by which one may arrive at a true conception of the results obtained through plastic surgery of the blood vessels.

A. N. Tasker.

Les Ulcères Perforés De L'Estomac Et Du Duodenum, by H. Mondor, Chirurgien des Hôpitaux de Paris, and G. Lauret, Ancien Interne des Hôpitaux de Paris. 8°, 186 pp. Masson et Cie, Editeurs, Libraires de l'Academie de Medicine, Paris, 1923.

This monograph is devoted entirely to a study of that most important condition—namely, peptic ulcer. The authors have attempted to cull from all modern literature those ideas on the subject which have been most definitely established and which are most practical in their application. They have sought less to review and compare all recent discussions on this subject than to prepare a manual of value for the practicing physician. He it is who must, in the last analysis, charge himself with the diagnosis and treatment of gastric and duodenal ulcer—a condition so often complicated by perforation.

Peptic ulcer, its perforation, and the resulting peritonitis are all described in detail. The signs and symptoms upon which diagnosis is to be based (sudden severe pain, rigidity and tenderness of the whole abdominal wall, the antecedent gastric manifestations, and the various subsidiary evidences), are all minutely analyzed and classified. The modalities of perforation from a clinical standpoint are shown to have differential signs. The usual mistakes in diagnosis are emphasized, particularly the diagnostic difficulties which are encountered in differentiating between a peritonitis of appendiceal origin and that which results from gastric or duodenal perforation. The considerations upon which must be based a decision as to the necessity of early operation as well as the brilliant successes obtained through the medium of such precocious surgery are placed before the eyes of the reader.

The authors urge that surgical treatment consist in the simplest possible operation—suture and invagination of the perforation with or without gastro-enterostomy. They claim that this method has proven the most reliable in securing a successful result, and that it constitutes a rapid and efficient method for the treatment of a condition which was formerly always fatal. The technical details have been fully described and adequately illustrated.

A. N. Tasker.

Diagnostic Methods, Chemical, Bacteriological and Microscopical; A Textbook for Students and Practitioners, by Ralph W. Webster, M.D., Ph.D., Assistant Professor of Medical Jurisprudence in Rush Medical College, University of Chicago; Director of Chicago Laboratory, Clinical and Analytical. Seventh edition, revised and enlarged, with 37 colored plates and 172 other illustrations. 8°, 901 pp. Philadelphia: P. Blakiston's Son & Co., 1923. Price, $8.00.

Since the publication of the sixth edition of this popular text, considerable research has been done along many lines of clinical diagnosis, and the author has succeeded in including much new material in this edition. The book is divided into eleven sections dealing respectively with sputum; oral, nasal, aural and conjunctival secretions; gastric contents; feces; parasites; urine; genital secretions; blood; transudates and exudates; secretion of the mammary glands; and clinical bacteriology. The book describes practically all of the laboratory tests in common use in each of these fields, and the descriptions are clear and complete. Among the newer procedures included may be

mentioned the recently introduced methods for typing pneumococcus in sputum, Kofoid and Barber's method for detecting ova in stools; urea concentration test, Van Slyke's method of determining oxygen capacity and hemoglobin content of blood, Stadie's method for detection of methaemoglobin in blood, Benedict's new method for uric acid in blood, Kolmer's standardized quantitative Wassermann test, Noguchi's new method for proteins in the cerebrospinal fluid, etc. The book is attractive in appearance and the numerous drawings are well executed. Of especial interest are the colored plates, of which there are 37. These are well printed and of considerable help to the student.

EDGAR ERSKINE HUME.

OVERWEIGHT? GUARD YOUR HEALTH: Among Adults the Overweights Have a Greater Prospect of Early Death than Have the Underweights, by Royal S. Copeland, M.D., Commissioner of Health, New York City. 8°, 122 pp. New York: Cosmopolitan Book Corporation, 1923. Price, $1.00.

This little book is a popular presentation of an important subject. The dangers of overeating and overweight are stressed and some timely rules for guarding against these evils are laid down. Tables of heights and weights are given for both men and women. The value of exercise, the proper manner of reducing and remaining at proper weight are given in detail. There is a series of menus for the various seasons of the year constituting well-balanced diets. The book is an excellent one for the physician to recommend to a patient, who is overweight and who desires to reduce safely. It is also valuable for those who seek to avoid this evil.

EDGAR ERSKINE HUME.

EPIDEMIOLOGY AND PUBLIC HEALTH, A Text and Reference Book for Physicians, Medical Students and Health Workers, in Three Volumes: by Victor C. Vaughan, M.D., LL.D., Chairman of the Division on Medical Sciences of the National Research Council; Emeritus Professor of Hygiene in the University of Michigan; Assisted by Henry F. Vaughan, M.S., Dr. P.H., Commissioner of Health of the City of Detroit, and George T. Palmer, M.S., Dr.P.H., Epidemiologist for the Department of Health of the City of Detroit. Vol I, "Respiratory Infections." 8°, 688 pp. St. Louis: C. V. Mosby Company, 1922. Price, $9.00.

This long-expected text has been received by public health workers and others with the enthusiasm that it deserves. It is one of the most exhaustive works that has appeared. The author divides communicable diseases into five groups (1) Respiratory, (2) Alimentary, (3) Precutaneous, (4) Venereal, and (5) Local. The first or Respiratory Group—by all odds the most difficult to deal with—fills the first volume. The diseases considered, a chapter being devoted to each, are Albuminal Diseases, Pollinosis, the Acute Coryzas, the Pneumonias, Measles, German Measles, Smallpox, Chicken-pox, Diphtheria, Scarlet Fever, Mumps, Whooping Cough, Influenza, Tuberculosis, Leprosy, Cerebrospinal Meningitis, Poliomyelitis, Glandes, also the effect of weather on diseases. Of these subjects the pneumonias occupy 56 pages, influenza 103, tuberculosis 105, and cerebrospinal meningitis 69. The author deals with epidemiology in its broad sense, giving not only the natural history of epidemic diseases but also symptoms, pathology, mode of combatting the disease, etc. By this broad conception the value of the book is greatly increased. Extensive use is made of information derived from the experiences of the

U. S. Army with communicable diseases, especially at the time of mobilization for the World War. The great number of graphs and charts, all of which are easily understood by any reader, adds much to the book.

"Epidemiology and Public Health" will without doubt prove of the greatest value both as a textbook for public health students and as a work of reference. We regret with the author that space does not permit of the inclusion of a more extensive bibliography, but this, he tells us, would have increased the size of the work by one-third. The author's decision to avoid technical terms in the book was most wise, for by so doing he has rendered it available to the non-medical student, while in no way detracting from its value to the student of medicine or public health.

EDGAR ERSKINE HUME.

EPIDEMIOLOGY AND PUBLIC HEALTH; A Text and Reference Book for Physicians, Medical Students and Health Workers, in three volumes. By Victor C. Vaughan, M.D., LL.D., Emeritus Professor of Hygiene in the University of Michigan, Assisted by Henry F. Vaughan, M.S., Dr. P.H., Commissioner of Health of the City of Detroit, and George T. Palmer, M.S., Dr. P. H., Epidemiologist for the Department of Health of the City of Detroit. Vol. II. NUTRITIONAL DISORDERS, ALIMENTARY INFECTIONS, PERCUTANEOUS INFECTIONS. 8°, 917 pp. St. Louis: C. V. Mosby Company, 1923. Price, $9.00.

The second volume of this important work is, like its predecessor, easily readable and of great interest. The material is arranged in the same manner, i. e., the diseases are grouped as to their modes of entering the body, though naturally there are exceptions, notably those diseases of which the avenues of infection are multiple or whose specific causative agent is unknown. The first group, nutritional disorders, includes the pathological conditions associated with defects in the accessory food factors such as xerophthalmia, scurvy, beriberi, pellagra and rachitis; endemic goitre and cretinism; food poisoning and botulism. The second group consists of the alimentary infections, cholera infantum, the typhoid fevers, Asiatic cholera, the dysenteries, sprue, Malta fever, and helminthiasis (the discussion of the last occupies about one-eighth of the volume). The third group of percutaneous infections embraces hookworm disease, filariasis, malaria, yellow fever, dengue, the trypanosomiases, framboesia, the Kala-azars, tetanus, Verruga Peruviana, Rocky Mountain Spotted Fever, Tularemia, plague, typhus fever, relapsing fevers, trench fever, epidemic jaundice, phlebotomus fever, anthrax, rabies, rat-bite fever, and snake-bite.

The volume contains an enormous amount of valuable information and forms the second part of a very complete treatise of the diseases to which man is subject. Information concerning the most recent advances in the particular field of epidemiology is included though the authors are cautious in accepting some of the new work. As a work of reference "Epidemiology and Public Health" is unexcelled and is far more comprehensive than the usual public health text. As in Volume I, the charts and graphs are well chosen and easily understood, even by the layman. Of especial interest to the military surgeon is the chapter on typhoid fever in which there are contrasted the rôles played by this malady during the Spanish-American War and in the World War, together with an account of the means taken to

prevent a recurrence of the awful loss of life that took place near Chickamauga, "The River of Death." The chapters on yellow fever and rabies portray vividly the natural history of these diseases. Certain other chapters—for example, that on typhus fever—do not discuss in such detail the general administrative measures for disease control.

EDGAR ERSKINE HUME.

THE FORM AND FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM, An Introduction to the Study of Nervous Diseases, by Frederick Tilney, M.D., Ph.D., Professor of Neurology, Columbia University; Attending Neurologist, the Presbyterian Hospital, and the New York Neurological Institute; Consulting Neurologist, Roosevelt Hospital, N. Y., and Henry Alsop Riley, A.M.M., Associate in Neurology, Columbia University, Associate Attending Neurologist, N. Y. Neurological Institute; Attending Physician, Neurological Department, Vanderbilt Clinic, New York; Foreword by George S. Huntington, Sc.D., M.D., Prof. of Anatomy, Columbia University. Second Ed., illustrated, 8°, 1,019 pp. New York: Paul B. Hoeber, 1923. Price, $12.00 net.

Without the kind of knowledge presented in this book no one can be an efficient neurologist. It is true that most of us have reached it by a more circuitous route. Those that come after us are to be felicitated in having placed at their feet through the prodigious labors of Doctors Tilney and Riley so clear, logical and complete a compendium of what these authors set out to present. The book does not aim to be a textbook of clinical neurology. It is "An Introduction to the Study of Nervous Diseases." The thesis of the book is the need for a fundamental knowledge of Anatomy and Physiology and their clinical applications, in order to distinguish alterations of structure from the much commoner perturbations of function not due to these. The authors allude to the frequency with which this distinction fails to be made, as has been pointed out so often by the reviewer following Babinsky, to whom we are indebted for the chief step in such delimitations. The authors emphasize the role of the integration effected by the nervous system and the necessity of it for functioning. This must be understood before its disorders can be intelligently grasped or dealt with. They trace the respective roles of the somatic and of the splanic mechanism, studying the evolution of each from the embryo up. The text is throughout explained by photographs, diagrams and drawings.

Not only is the anatomy and physiology of each system and organ clearly described, but concerning each there is an attempt to make a clinical application by description of the effects of an accident to each organ or system throughout the whole nervous system. A thorough grasp of these furnishes a far better ground work for the understanding of actual patients than does the reading of the usual type of textbook. Even the observation of a large number of cases fails to give the kind of understanding capable of differentiating the exceptional or anomalous situation which does not conform to the conceptions of an experience purely clinical. Hence, that one does not find a description of such syndrome as *tabes dorsalis* cannot be imputed as a fault. However, perhaps one may be dissatisfied with the difficulties in using the index.

TOM A. WILLIAMS.

DISEASES OF THE NERVOUS SYSTEM, A Textbook of Neurology and Psychiatry, by Smith Ely Jellif and William A. White. Fourth Ed., illustrated, 8°, 1,119 pp. Philadelphia and New York: Lea & Febiger, 1923.

Very different from the foregoing is the mode of approach in the next text. In both a general introduction indicates a point of view taken by the authors concerning the nervous system. The latter has the merit of being the first English clinical work in which, following Grasset, the disorders of the nervous system are frankly grouped in accordance with the physiological systems, the vegetative, the sensory-motor, and the symbolic. Nearly a fifth of the work is given to the first, while besides a good deal in the introduction and a little under Methods of Examination, the last 243 pages describe the psychical systems. This may seem very little in view of the predilections of the authors and the great importance of these latter affections, but the book is impregnated by a psychogenetic viewpoint to the extent of such exaggerations as that "tic douleureux" is often "curable by psychoanalysis."

Necessarily in so compendious a work all the compilation has not been equally digested. The utility of further textbook descriptions of diseases is doubtful. Far better is the mode of approach indicated in the book of Tilney, but this book at least has the merit of a coherent view of diseases of the nervous system without distinction of psychiatry, psychopathology and neurology. It endeavors to show the dependence of the disorders often so unfortunately classified under these heads upon conditions classed under one or both of the other heads. It will have a tendency, therefore, to get rid of the artificial separation of practitioners into neurologists, psychiatrists, psychopathologists and endocronologists, as it aims to show the mutual interdependence of disorders placed under these headings. Of course there are many opportunities for faultfinding, as for instance the classification of "migrane" as "aspastic anaemia," and there is a good deal of undigested material inadequately presented, while much fault could be found with the extreme adhesion to the assumptions of such psychoanalysts as Freud, Jung, and Stekel. The diagrams of Dejerine, Gaskell, and others are most freely used to summarize anatomical and diagnostic data. But after all, through this "salade d'un livre" runs the thesis of integration, and while its clinical applications often seem rash, yet integration is the principle too often forgotten, even by clinical neurologists and neuropathologists of prolonged training.

TOM A. WILLIAMS.

COLONEL JAMES ROBB CHURCH, 1866-1923

309

THE
MILITARY SURGEON

VOL. 53 OCTOBER, 1923 NUMBER 4

JAMES ROBB CHURCH

Colonel James Robb Church, Medical Corps, United States Army, Retired, died at his home in the City of Washington on August 28, 1923.

Colonel Church, second son of Alonzo Church of Georgia, was born in Chicago, Illinois, on October 11, 1866. When he was ten years of age his family removed to Washington, and here Colonel Church spent his boyhood. At the age of eighteen he entered Princeton University, where as a student he was one of the star players on the University football team. He was graduated from the institution as a Bachelor of Arts in 1888. Four years later his Alma Mater conferred on him the degree of Master of Arts. He studied medicine at Columbian (now George Washington) University and graduated in 1893.

He served as a member of the staff of several Washington hospitals and practiced his profession until the outbreak of the Spanish-American War, when he was commissioned Assistant Surgeon of Volunteers and assigned to the First United States Volunteer Cavalry, commonly and affectionately known as the "Rough Riders." Dr. Church was ordered to Cuba with his regiment and served as its surgeon throughout the entire campaign. There is no more forceful way of describing the character of the service he rendered than by quoting verbatim an extract from General Orders No. 165, War Department, August 7, 1909. This General Order gives the names of the seven officers and enlisted men who were awarded the Medal of Honor between 1904 and 1909. We read that Major James Robb

Church, Medical Corps, then Assistant Surgeon, First United States Volunteer Cavalry, was awarded the Medal of Honor for gallantry at Las Guasimas, Cuba, on June 24, 1898, when he "In addition to performing gallantly the duties pertaining to his position, voluntarily and unaided carried several seriously wounded men from the firing line, to a secure position in the rear, in each instance being subjected to a very heavy fire and great exposure and danger." The Medal of Honor was publicly presented to Major Church by President Roosevelt at the White House on January 9, 1905. This was the first award under the regulations regarding the presentation of the Medal of Honor by the President in person.

Dr. Church was honorably mustered out of the volunteer service on May 15, 1898, and on December 12 of the same year entered the Medical Corps of the Regular Army as Assistant Surgeon. He was promoted to Captain, Assistant Surgeon, on August 8, 1903; to Major on May 1, 1908; to Lieutenant Colonel on May 15, 1917, and to Colonel on the same date. During his service as an Army Medical Officer, Colonel Church had an interesting and successful career. At various times he served at Washington Barracks, the United States Military Academy, Fort Trumbull, Conn.; Fort Terry, N. Y.; Fort H. G. Wright, N. Y.; Fort Brown, Texas; Fort Robinson, Nebraska; Fort Ontario, N. Y.; Fort Williams, Maine; Fort Crockett, Texas, and with the National Guard of the New England States and other stations.

Following the great disaster on the island of Martinique in 1902 caused by the eruption of Mt. Pelée, he, with two other lieutenants of the Medical Department, was ordered to the island on board the U. S. Cruiser *Dixie* to distribute medical supplies and render necessary medical attention. Upon the completion of this duty he wrote a graphic description of the disaster.

Dr. Church served in Cuba during the occupation following the Spanish-American War, at Santiago and Manzanillo. He was again in Cuba during the Pacification

from 1906 to 1909, at which time he was Assistant Sanitary Officer in Havana.

When it was decided, in the autumn of 1914, to order an American medical officer for duty as observer with the French Army, Major Church was selected for the detail. The reports that he furnished his Government of field conditions were of the greatest value and covered a wide range of subjects such as the operation of sanitary trains, evacuation of wounded, the incidence of contagious diseases in the French Army before and during the great war, the sterilization of drinking water in the field, the housing of men needing surgical and medical care, etc. The greatest service rendered by him while observer, however, was his careful study of the means taken to protect troops from asphyxiating gases, and his exhaustive study of this subject was of untold value to the American Army.

On May 25, 1917, he was relieved from further duty as an observer with the French Army and directed to report to the Commanding General of the American Expeditionary Forces as assistant to the Chief Surgeon. Then it was that under General Pershing's orders Colonel Church undertook the difficult and responsible task of organizing our Gas Service, a problem which he solved admirably because of his great familiarity with the intricacies involved to which must be added an inherent organizing genius. After the first American troops had arrived in France, Colonel Church examined the gas masks which had been sent for their use and reported that they would not protect the wearers against the enemy's gases. Desiring to test one, he wore it in several gas chambers where he was subjected to the action of a series of gases with the result that he was himself gassed. This act on his part prevented thousands of casualties among the men of the First Division. When later General Fries came to France and assumed direction of the Gas Service, Colonel Church remained in charge of the defensive section of the Gas Service and at the same time was liaison officer between the American and French Gas Services. His thorough knowledge of the

French language and customs made his services invaluable.

In the spring of 1917 pneumonia, contracted while at the British Front, prevented his representing the United States at the Interallied Surgical Conference at Paris.

Illness contracted in line of duty necessitated his retirement from the active list of the Army on January 12, 1918, and he returned to the United States shortly thereafter. In spite, however, of his illness, he remained on active duty over three years, during which time he was on duty in the Office of the Surgeon General of the Army, serving for a part of that time as Executive Officer.

On December 1, 1918, Colonel Church succeeded Col. Louis A. La Garde as Secretary-Treasurer of The Association of Military Surgeons, of which he had long been a member, at the same time becoming editor of THE MILITARY SURGEON. These positions he held until his death, and under his able direction the affairs of the Association were well administered and its journal brilliantly edited.

Colonel Church passed away at his home in Washington very suddenly on the night of August 28, 1923. Though his health had not been good for some time, the end was most unexpected. His family were away from the city. Some of his intimate friends who had seen him in the afternoon had no knowledge of any change for the worse.

He is survived by Mrs. Church, *née* Miss Beulah Boss, of New London, Conn., and two daughters, Miss Susan and Miss Mary Church.

Colonel Church was a soldier of the greatest courage, a medical officer of exceeding skill and a writer of rare ability, and withal ever imbued with an unselfish spirit of devotion to duty. His numerous friends in the Service and out will miss him sadly, and in his passing the Service has lost one of its most valued officers. He was a man of great natural charm, and his soldierly bearing well became one upon whom the country had conferred her highest honor.

EDGAR ERSKINE HUME.

WHAT THE UNITED STATES PUBLIC HEALTH SERVICE IS DOING TO PREVENT THE SPREAD OF LEPROSY IN THE CONTINENTAL UNITED STATES

By EDWARD R. MARSHALL, A.B., M.D.
Surgeon, United States Public Health Service

NEARLY two score years ago a commission of experts, appointed by the Surgeon General for the purpose of investigating the origin and prevalence of leprosy in the United States, recommended the establishment of a national leprosarium for the care and treatment of these unfortunate people. After years of persistent effort on the part of those who appreciated the possibility of an increase in leprosy in the United States, largely on account of the cosmopolitan character of our population, Congress, under the provisions of an act, approved February 3, 1917, entitled, "An Act to provide for the care and treatment of persons afflicted with leprosy and to prevent the spread of leprosy in the United States," appropriated sufficient funds for the establishment of such an institution. After very diligent search by the Public Health Service for a suitable location, the Louisiana Leper Home, which had been in operation a number of years at Carville, was purchased January 3, 1921, from the state of Louisiana. For the first time since the foundation of the Government, specific provision was thus made for lepers who might be found among its employees, especially those returning from overseas service.

Nearly four years elapsed between the passage of the act and the acquisition of the reservation by the Government. This was due to the strenuous objections of the various states to having a leprosarium located within their borders. Since the date of acquisition by the Government, this home, officially known as U. S. Marine Hospital No. 66, has been extensively rehabilitated and enlarged, and, at the present time, affords accommodations for 172 lepers. All available beds are constantly occupied, and there is a waiting list of approximately 100 known lepers who desire to take advantage of the facilities of the institution.

Owing to the insistent demands made upon the service by the health authorities from practically every state in the Union to admit lepers, it became necessary to increase materially existing facilities at this leprosarium. Accordingly, Congress, on March 4, 1923, appropriated the sum of $645,000 for the purpose. When the present building program, which will be under way in the very near future,

is completed, beds will be available for a total of approximately 500 patients. In view of the fact, however, that there are, in accordance with the most conservative estimates of authorities competent to judge, fully 1,000 persons suffering from leprosy in the United States, the time is not far distant when Congress will be asked to appropriate funds for the care of an additional 500 patients.

In the light of our present knowledge of this disease, strict isolation is the only effective remedy in limiting its spread, and all funds necessary to carry out this most important piece of public health work should be provided by Congress. As evidenced by the following excerpts from an opinion of the Solicitor of the Treasury and regulations on the subject, the U. S. Public Health Service has, in cooperation with the proper state, territory, or District of Columbia health authorities, sufficient authority to carry its program of isolation into effect and thereby prevent the spread of leprosy in this country. His opinion is based on Section 3 of the broad powers contained in the act of February 15, 1893, which reads, as follows:

> That the Supervising Surgeon General of the Marine Hospital Service shall, immediately after this act takes effect, examine the quarantine regulations of all state and municipal boards of health, and shall, under the direction of the Secretary of the Treasury, cooperate with and aid state and municipal boards of health in the execution and enforcement of the rules and regulations of such boards and in the execution and enforcement of the rules and regulations made by the Secretary of the Treasury to prevent the introduction of contagious or infectious diseases into the United States from foreign countries, and into one state or territory or the District of Columbia from another state or territory or the District of Columbia; . . .

The Solicitor states that the act of February 15, 1893, is a grant of all powers necessary to prevent the spread of leprosy in the United States.

The act of February 3, 1917, has to do only with a particular home. It adds nothing to, and takes nothing from, authority granted and responsibilities imposed by the act of 1893. Section 2 of the act of February 3, 1917, designates those persons who shall be received into the home under regulations prepared by the Surgeon General, with the approval of the Secretary of the Treasury:

> 1. Any person afflicted with leprosy, who presents himself or herself for care, detention, and treatment, or
> 2. Who may be apprehended under authority of the U. S. Quarantine acts, or

3. Any person afflicted with leprosy duly consigned to said home by the proper health authorities of any state, territory, or the District of Columbia.

Upon request of these authorities, the Surgeon General of the Public lic Health Service is authorized to send for any person afflicted with leprosy within their respective jurisdictions and convey him to the leprosarium for detention and treatment. Section 3 provides:

That regulations shall be prepared by the Surgeon General of the Public Health Service, with the approval of the Secretary of the Treasury, for the government and administration of said home and for the apprehension, detention, treatment, and release of all persons who are inmates thereof.

Section 3 of the act of 1917 makes it the duty of the Public Health Service to prepare regulations, with the approval of the Secretary of the Treasury, under which the National Home shall be governed and for the care, treatment, detention, apprehension and release of its inmates. If the Public Health Service and the Secretary of the Treasury find that the detention of the lepers in the home is an appropriate method of attaining the ends enumerated in the act of 1893, the question as to what the rules should be to prevent escape is one of administrative discretion. It is the same with regard to the apprehension of inmates who may escape from the institution. One of the ends of the law of 1893, as well as this law of 1917, is to prevent the spread of leprosy in the United States.

It is said that:

"In this instance, since the home is situated in the state of Louisiana, all persons who escape, of course, become temporarily subject to the laws of that state with regard to the apprehension of lepers. . . ."

Whether this would be the case with regard to escaped lepers who had been consigned to the home for *detention* and treatment by the proper health authorities of other states, is very doubtful. But be that as it may, if the state or municipal authorities of Louisiana should not cooperate with the Public Health Service in enforcing the rules and regulations promulgated by the Secretary of the Treasury to carry out the purposes of the act of 1893 or should ignore such rules and regulations providing for the apprehension of escaped lepers to prevent the spread of leprosy, the authority to apprehend is found in the act of 1893 and that, too, where local authorities may fail to cooperate or local regulations may be inadequate.

The Solicitor has recently ruled that the Public Health Service is authorized to use force, if necessary, in transporting persons afflicted with leprosy to the leprosarium.

The following regulations promulgated by the Secretary of the Treasury, December 4, 1922, for the government of this home, con-

cerning detention and discipline, indicate very clearly that the Government intends to enforce its policy of beneficent isolation:

Paragraph 6-*a*.—No patient shall, under any circumstances, proceed beyond the limits of the reservations set aside for the detention of the patients suffering from leprosy.

Paragraph 7-*a*.—There shall be provided the necessary accommodations within that part of the reservation set aside for persons afflicted with active leprosy for isolation or restraint of patients, when, in the judgment of the Medical Officer in Charge, such action is necessary for the protection of themselves or others.

To contract leprosy is not a crime. It is, in most cases, unavoidable. Once a leper is in detention, however, it is a crime against society for him to abscond and subject his fellow human beings to the risk of contracting a malady that is practically incurable. To restrain such an individual is for the public good. This the law does with justice.

With few exceptions, the lepers at Carville are happy and contented with their lot. Here, in comfortable quarters located on a beautiful 358-acre tract of land, with good food, excellent medical and surgical attention and nursing, and a diversity of amusements, these unfortunates, the wards of the Government, are living out their lives carefree and without worry and in full realization of the fact that they are no longer a menace to the health and contentment of their fellow-beings. The number of patients absconding from the home is growing less as time goes on. Last year there were only 9 absconders out of an average of 172 patients. During the year ending June 30, 1923, 27 persons were transferred to the leprosarium.

Leprosy was the first disease for the transportation of which specific regulations were made. The Interstate Quarantine Regulations have provided rules for the safe transport of lepers since 1912. The revised regulations prescribe the following procedure:

Sec. 5.—*Travel of Lepers.*—Common carriers shall not accept for transportation or transport in interstate traffic any person known by them to be afflicted with leprosy, nor shall any person so afflicted accept such transportation except as hereinafter provided.

(*a*) A person afflicted with leprosy shall be permitted to accept transportation upon presentation of permits from the Surgeon General of the United States Public Health Service, or his accredited representative, and from the health authorities of the states, territories, or District of Columbia to and from which he intends to travel, stating that such person may be received under such restrictions, which shall be specified in each instance, as will prevent the spread of the disease, provided such person shall have agreed in

writing to comply, and does so comply, with the restrictions as specified.

(*b*) Any person who presents symptoms of leprosy and who is traveling or who has left the state where he resides in violation of the above regulations shall be detained and, if proved to be a leper, shall be returned to such state or removed to such federal station as the Secretary of the Treasury may designate, and the proper health authorities notified.

The Standard Railway Sanitary Code has practically the same restrictions relative to the transportation of lepers, as follows:

Sec. 8.—*Leprosy.*—Common carriers shall not accept for transportation nor transport in any railway train, or other conveyance any person known by them to be afflicted with leprosy, unless such person presents permits from the Surgeon General of the United States Public Health Service or his accredited representative, and from the state department of health of the states from which and to which he is traveling, stating that such person may be received under such restrictions as will prevent the spread of the disease, and said restrictions shall be specified in each instance; and no person knowing or suspecting himself to be afflicted with leprosy, nor any person acting for him, shall apply for, procure, or accept transportation from any common carrier unless such permits have been received and are presented, and unless the person so afflicted agrees to comply and does so comply with the restrictions ordered.

After the necessary state permits are received, patients are transferred to the leprosarium accompanied by a medical officer of the Public Health Service. A compartment is provided for the patient, who is strictly isolated during the trip. All dishes and utensils are disinfected before leaving the compartment, all secretions or discharges disinfected and properly disposed of, and the space occupied is disinfected upon being evacuated by the patient.

Isolation of lepers while being transported may be carried out with entire safety. Objection is often made by the railway officials to assigning space for this purpose. However, under the interstate quarantine regulations issued by the Secretary of the Treasury, a common carrier cannot refuse space, if such be available. As now practiced by the Public Health Service, the transportation of lepers is effected without exposing the public to any danger of infection.

In the selection of cases for transfer to the leprosarium, the policy in effect at present gives primary consideration to the types of the disease wherein open lesions are found. Such types are a positive menace to the public health in their respective communities. Due consideration is, of course, given to the climate where

the leper is found, his economic status, degree of isolation, and the date of application. It goes without saying that veterans of our various wars are on the preferred list of applicants and are admitted upon the existence of a vacancy. Nine such are now at Carville.

During the past fiscal year, efforts have been concentrated on reclaiming the portions of the reservation which have not been under cultivation since the Civil War. Of the 358 acres comprising the reservation, all have been reclaimed, with the exception of a small wooded portion. This is being cleared of underbrush and will be reopened as shelter for cattle during the summer months. Extensive drainage has been completed, rendering the soil more valuable for farming purposes and effectually disposing of the mosquito nuisance which has been a menace in the past. Six miles of roads have already been built on the reservation, 3 miles of which have been surfaced with gravel and are semipermanent in nature. The remainder will be finished in the near future.

In the latter part of the year, a herd of dairy and beef cattle, approximately 150 in number, was shipped to this station from the U. S. Marine Hospital at Fort Stanton, N. M., in order that, with the present and contemplated farming facilities, the hospital may become more nearly self-supporting. In addition to the routine maintenance of the premises, a non-climbable type of fence has been erected around the entire property, consisting of steel posts set in concrete footings, supporting twelve strands of barbed-wire. The live oak trees, which are among the most beautiful in the state of Louisiana, have been given careful attention by one skilled in tree surgery. A number of fire hazards have been removed, and, with the acquisition of a complete fire-fighting equipment and the institution of frequent fire drills for the patients and personnel, the hospital has been rendered less liable to the danger of conflagration.

By unanimous vote of the lepers, and upon bureau authority, the old leper cemetery, which formerly occupied a location of great prominence on the hospital campus, has been razed and replaced by a park. An imposing granite shaft, bearing a bronze tablet with the names of all leper dead inscribed thereon, has been erected in the center of this tract. A new cemetery has been laid out and is now being beautified at a new site on the premises.

Due to the loathsome nature of the disease treated in this hospital, great difficulty was encountered in securing a dentist to perform much-needed work. A capable, full-time dental officer is now on duty. He has found that 70 per cent of the lepers have pyorrhea in

advanced stages. By the necessary extractions and treatment, marked improvement has been made in the condition of the mouths of the lepers, and, in some instances, considerable general physical improvement has been observed.

Seventy-three patients have received treatment during the year with ethyl esters of chaulmoogra oil, some have been under treatment for more than two years, 7 have died of intercurrent affections, 6 have grown worse, 26 remain in an unchanged condition, 5 have slightly improved, and 29 show distinct improvement. It has been noted in this hospital that improvement takes place in a portion of the patients after having taken the treatment for a few months. The improvement reaches a maximum in about six months, and no further benefit of note is derived. Up to the present time, after approximately three years of trial, no patient has become bacterioscopically free from the leprosy bacillus. It is obvious that thus far no patients have been paroled from the institution.

Modern technique in measuring X-ray dosage, as compared with the more or less uncertain methods of former years, which gave unsatisfactory results, has stimulated a revival of X-ray treatment of leprosy. During the last few months, a selected number of lepers has been given X-ray treatments, with results which have not been discouraging, and intensive roentgenographic study is being made of the bone changes common in lepers from examinations made of a large number of patients at regular intervals, with the ultimate purpose of presenting for publication an atlas of the findings.

From a recent study of the pathological changes in the eyes of lepers, it was found that 13 per cent of the patients in this hospital are completely blind, 5 per cent are nearly blind, and only 30 per cent have normal vision. The frequent refraction of the eyes of the patients by specialists in ophthalmology, with appropriate surgical and medical treatment where indicated, have been instituted as prophylactic measures intended to minimize future blindness among the lepers.

All patients in the hospital have been serologically examined for syphilis. In a series of 159 cases of leprosy, clinical or serological evidence of syphilis was found in 27, or 17 per cent.

In addition to the very best medical and surgical care, excellent nursing, and good food, the recreational and religious side of life, so necessary in an institution of this character, are not forgotten.

Two moving picture entertainments, consisting of a comedy, news weekly, and a serial, are furnished the patients weekly. As

evidence on the part of the patients of their enjoyment of these entertainments, they have collected among themselves funds whereby a third weekly entertainment has been given on a number of occasions. From the standpoint of morale of the patients, the moving picture machine, more perhaps than any other one thing, has served to distract and render them more nearly content with their isolation. A small building has been set aside for use as a club house and canteen for the patients. This room is equipped with a pool table and library. The canteen is stocked from private funds donated from various sources, and profits from sales are used to increase the canteen stock or for the purchase of miscellaneous articles for the general entertainment of the patients. A player-piano and Victrola have been provided and an orchestra is being organized among the patients. In addition, there are several tennis courts, where those who desire may get proper outdoor exercise.

Due to the commendable zeal and efficiency of the present Medical Officer in Charge, Surgeon O. E. Denney (Reserve), who has had long and valuable training in the care of lepers in the Philippines, this leprosarium is fast developing into a model of its kind, and, when enlarged to meet present and future needs, will be a credit to our Government and a source of pride and inspiration to those who have labored so long and effectively to combat the spread of leprosy in the United States.

UNIFORM NOMENCLATURE FOR BLOOD COUNTING

By Major R. E. SCOTT, *Medical Corps, U. S. A.*, and R. W. FRENCH, *Laboratory Service, Walter Reed General Hospital, Washington, D. C.*

ON ACCOUNT of the many variations in differential blood reports occasioned by different leucocytic nomenclatures in vogue an effort has been made to standardize such work and to use a standard classification in keeping with the more recent work in cytological pathology, embryology and physiology. It is appreciated that this is not easy, inasmuch as many of the more recent works on clinical methods still recognize the triacid stain and almost entirely disregard the more advanced methods of studying the blood.

As a foundation to making this standard classification Mallory (1), Simon (2), Lewis and Stöhr (3), the several numbers of the Journal of Experimental Medicine with reference to the culture of living cells *in vitro* as well as our own experience in counting several hundreds of slides of leukemic blood have been taken into consideration. While it is impossible at this time to absolutely prove a given genesis for a particular type of cell, it is believed that the evidence has been well weighed and that proof will gradually be forthcoming.

The terminology used on the present blood count report in the army clinical record is used as far as possible. The only change is the dropping of the so-called transitional cell. Under normal conditions the following types of leucocytes are recognized under the standard nomenclature:

Small mononuclears (lymphocytes).
Large mononuclears (endothelial leucocytes).
Polymorphonuclear neutrophiles.
Polymorphonuclear eosinophiles.
Polymorphonuclear basophiles.

While under pathological conditions any of the following forms may be found:

Lymphoblasts (embryonic lymphocytes).

(Plasma cells or the co-called Türck or irritation cell. These may form either from lymphoblasts or lymphocytes under certain irritative conditions little understood from a pathological standpoint, and generally speaking having little significance when seen in the peripheral blood.)

Neutrophilic myelocyte (embryonic polymorphonuclear neutrophiles).

Eosinophilic myelocyte (embryonic polymorphonuclear eosinophile).

Basophilic myelocyte (embryonic polymorphonuclear basophile).
Myeloblasts (embryonic myelocytes).
Normoblasts (embryonic erythrocytes).
Megaloblasts (embryonic normoblasts).

Experience has proven that, for intelligent and uniform results in differential blood counting, a great deal of eye training with a thorough knowledge of blood cell embryology is essential. There are so many small variations in the nuclear and protoplasmic structure of the several cells that it is only through considerable training that their recognition becomes an instantaneous and unfailing procedure which is necessary for accurate results. All stages, for instance, will be found in leukemic blood from the very immature myeloblast to the aged polymorphonuclear neutrophile with its five or six-lobed nucleus passing through several different appearances in the myeloblastic and myelocytic stages, to say nothing of the changes in the nucleus of the adult cell, considered in the Arneth classification. Now and then a megakarocyte appears for good measure, and to the trained eye it will be instantly classified and properly placed. In the classification of blood cells nuclear structure is sometimes the ruling factor; again the relation of the nucleas to the protoplasm, or again certain granules and their staining reactions and size must be taken into consideration.

Variations in cellular appearance the result of staining reactions, thickness of the smear, condition of the slide, humidity, and many other factors also must be thoroughly understood if correct differential blood counting is to prevail. In a smear too thick it is almost impossible to differentiate between the large and small mononuclear elements, while the polymorphonuclear eosinophiles often appear like a neutrophile and are entirely overlooked. Any of the granular cells are difficult to make out properly in a thick smear.

Nuclear structure is of special importance in differentiating between the lymphoblast and the lymphocyte or between the normoblast and the megaloblast. In either case the presence of the more embryonic form is of much the greater import. The embryonic cell presages a much more acute condition and often means classifying as acute what all other evidence might point to being a chronic condition. On nuclear structure alone a case of lymphatic leukemia was recently classified as acute, and the classification was fully justified by the rapid course and early termination of the case. This diagnosis was made in the laboratory after a five-minute study of the blood slide and a classification of the cells, by reason of the

fact that there was a great preponderance of the embryonic over the mature forms of the small mononuclears.

Under normal and physiological conditions the number of leucocytes per cubic millimeter of the blood may vary between 4,000 and 12,000, possibly as high as 15,000 at times without true pathological conditions existing. Bathing, digestion and exercise will induce a considerable increase. Within these figures, however, under physiological conditions, the differential count will remain within the following limits:

Polymorphonuclear neutrophiles, 65 to 72 per cent.
Polymorphonuclear eosinophiles, 1 to 2 per cent.
Polymorphonuclear basophiles, ¼ to ½ per cent.
Small mononuclears, 20 to 30 per cent.
Large mononuclears, 4 to 10 per cent.

Of the several results from a blood count the diffential leucocyte count undoubtedly gives the more information. However, in considering a differential count it must be recollected that it is a percentage count and does not give the absolute values per cubic millimeter for the several cells, which is of really greater importance as the percentage count alone may be very misleading. For instance, in the case of myelogenous leukemia, with an absolute count of 150,000 and 3 per cent small mononuclear cells in the differential count, it may be said that there is a great reduction in the small mononuclears. This, however, is far from being the case. Three per cent of 150,000 is 4,500; or a total of 4,500 of these cells per cubic millimeter. Taking an average of 25 per cent as normal and a total count of 7,500, we find that the average number of this type cell per cubic millimeter is really about 1,900.

This method of analysis should be used in the study of all differential blood counts if the true pathological condition suggested is to be truly realized. Then actual, not relative, increases or decreases are seen and properly appreciated to the mutual benefit of the doctor and the patient.

Embryologically the lymphocyte series of cells in the blood is recognized as originating within the lympth tissues throughout the body, but more specially in the lymph nodes. Mallory states definitely that none of this type of cell is derived from the bone marrow, and that no true lymphoid tissue is to be found in the bone marrow except when a few cells are attracted to that location on account of inflammation or other foreign influence.

This conception is strengthened by the work of Murphy, Sturm

and Nakahara (4) with reference to the effects of dry heat and X-rays on the blood picture and their findings with reference to the lymphoid tissue in the body. These effects were specially notable with reference to the cells of the lymphocytic series and the tissues most affected were the lymph nodes and the spleen, a recognized lymphatic structure.

Probably the large mononuclear leucocyte is derived from the endothelial cells lining blood, and to a less extent lymph, vessels by proliferation and desquamation; hence they may well be called endothelial leucocytes. They also multiply by mitosis after emigration from the vessels into lesions. This leucocyte is specially active as a phagocyte and probably goes to form the so-called foreign body giant cell in the tissues which is so noticeable in certain inflammatory conditions. Hence, the increase in this cell in the peripheral blood under certain conditions of chronic inflammatory character as tuberculosis, syphilis or malaria (the increase in the latter instance no doubt being more due to the mechanical disturbance set up within the blood vessels rather than to a true inflammatory reaction).

The so-called transitional is not recognized in this classification, it being considered rather as a degenerating endothelial leucocyte and is classified in that category. This is in keeping with the findings of Mallory. It, likewise, is a direct result of the counting of many slides on leukemic cases, where the absence of this form is specially noteworthy, when with the increase in polymorphonuclear elements an increase of the so-called transitional form would be expected. Rather, a true transitional cycle between the myelocyte and the polymorphonuclear stage is certainly made out with ease, while the granulation typical of the adult polymorphonuclear cells has never been seen, even in degree, in any stage of the so-called transitional cells. Also, many of the so-called transitional forms are found partially broken up in the blood smears, which it is believed indicates that they have much less resistance and strength than the other forms which display more resistance to injury.

The remaining normal leucocytes, all polymorphonuclear, are probably derived from the bone marrow, passing successively through the stage of myeloblast and myelocyte to the differentiated and adult polymorphonuclear leucocyte, with neutrophilic, acidophilic or basophilic granules as the case may be. This cycle may eventually be established by methods of *in vitro* culture which offers many possibilities toward proving cellular genesis.

Of the polymorphonuclear cells the neutrophilic is of the greater

importance, as the ratio of these cells, both in the peripheral blood and in the tissues, serves as a valuable index in pyogenic infections. Simon (2) uses the term septic factor with reference to the increase of the neutrophilic cells with an absence or decrease of the eosinophilic elements. In experience here this has been found to hold good.

It is accepted that an increase of the polymorphonuclear neutrophiles with an absence of eosinophiles indicates sepsis, while the presence of the eosinophiles indicates either a chronic condition or resolution. This, in connection with the total leucocyte count as an index of resistance, is specially valuable in diagnosing septic conditions or the progress of an infection. In following post-operative conditions, it also is very valuable.

The eosinophile is specially noticeable in intestinal tissue, and its percentage (both relative and absolute) also is greatly increased in the case of certain parasitic infections, all intestinal and some of a more general nature such as trichinosis. An eosinophilia also is noted in certain acute tuberculous conditions and during recovery from any acute pyogenic infection.

The blood picture will generally well parallel the course of a given case, though it will often require analysis by means of the absolute count of the several types of cells and the total cell count to fully appreciate the true pathological condition. This is particularly necessary to realize the amount of body resistance being shown; and unless the absolute count is considered a sudden fall in resistance may be overlooked, and a true prognosis not arrived at until too late.

The presence of any of the pathological forms of the blood cells in the peripheral blood indicates an increased activity of the blood-forming organs and the more embryonic the cells, the more acute the process and the less favorable the prognosis. The leukemias may be looked upon as nothing more or less than a fluid tumor in which the constitutent cells of the tumor are being carried throughout the system in the blood stream. Seldom is a true focus found. In the consideration of these conditions the rule may always be followed that the more embryonic the cell the more malignant the condition as prevails in the study of other tumor conditions. This is the principle basis in classifying leukemias into acute and chronic conditions and to arrive at some reasonable prognosis or to appreciate the value of treatment.

The lymphocytes and lymphoblasts are specially active in tumors

of the lymphatic system or in cases of a chronic inflammatory nature, while in acute conditions the polymorphonuclear elements are the more active. Few, if any of the embryonic forms are found in the peripheral blood except under unusual conditions of drain, such as an acute secondary anemia, or under true pathological conditions affecting the blood-forming organs proper, as the leukemias or primary anemias. Plasma cells may appear in the peripheral blood as the result of a long continued chronic inflammatory process and serve to indicate a low grade irritation of some or all of the lymphatic system; generally the result of outside causes.

ERYTHROCYTIC CHANGES

While making a differential count the recognition of any changes in red cells also is essential. In this work the following types of degeneration are recognized:

Polychromatophilia (change in staining reaction).
Basophilic stippling (change in staining reaction).
Achromia (loss of hemoglobin per cell).
Anisocytosis (variations in size).
Poikilocytosis (variations in shape).

These various degenerations, given in order of importance, all indicate a certain drain on the blood and, varying in degree, may serve to indicate a true disease of the blood-forming organs. Polychromatophilia is common in any condition causing a decrease in the number of red cells, or otherwise a slight drain on the blood or blood-forming organs. Basophilic stippling is simply a more acute stage in this sign of degeneration. Cabot rings likewise are a more acute form of cellular degeneration along similar lines and indicate a much graver condition.

Achromia is more common in the secondary anemias and goes hand in hand with any condition wherein the color index is low. It has little special value other than serving to indicate the necessity of a hemoglobin determination and absolute count of erythrocytes.

Anisocytosis and poikilocytosis, however, are quite important and are always noteworthy in any of the true anemias, varying in degree according to the acuteness of the condition. Poikilocytes in particular are always noteworthy in primary anemias and indicate a much greater drain on the blood than is being taken care of by the production of erythrocytes.

The nucleated (embryonic) erythrocytes are not common in the circulating blood and their presence always has pathological signifi-

cance, either indicating a greatly increased (sudden) activity of the blood-forming tissues or a chronic drain which the system is not able to overcome. In certain post-operative conditions the presence of nucleated red cells may be a good sign in that it indicates an activity of the bone marrow in replacing destroyed cells, and the quick repair of surgical damage.

In the classification of the nucleated erythrocytes the term micro and macroblast is not taken into consideration as these two terms merely recognize changes with reference to size and not the changes with reference to nuclear structure which is a true indicator as to cellular conditions. The megaloblast may divide by mitosis in the peripheral blood; the normoblast never. However, the normoblast may undergo karyokinesis in the peripheral blood and thereby lose its nucleus and become a mature erythrocyte.

REFERENCES

(1) Principles of Pathologic Histology, 1914, Mallory.
(2) Clinical Diagnosis, 1922, Simon.
(3) A Textbook of Histology, 1913, Lewis and Stöhr.
(4) The Journal of Experimental Medicine, No. 1, 1919.

THE IMMUNITY FOLLOWING SMALLPOX VACCINATION[1]

By Surgeon J. P. LEAKE
Hygienic Laboratory, U. S. Public Health Service

THE FACTS presented here on the immunity following vaccination against smallpox are by no means new—the author's only contribution is to verify a few of them—but the statements regarding this immunity are so many and so conflicting that a summary of the subject may not be out of place even at the risk of diminishing slightly the faith in the infallibility of such protection which is held in some quarters.

Vaccination protects against smallpox and against itself. This general truth cannot be doubted by anyone with experience in the disease and in vaccination. The fact of their mutual protection is independent of the identity or non-identity of variola and vaccinia.

IMMUNITY TO VACCINIA

The results of vaccination following a previous vaccination have never been so carefully studied as by Pirquet, and the various changes in the reaction following vaccination which he described may be taken as an indication of immunity in its broadest sense, that is, of an altered reactivity to infection.

These changes are in the nature of a modification of the normal course of primary vaccinia. In the usual previously non-immunized person the site of vaccination begins to redden for a millimeter or two around the insertion in about three days and shows its central part raised with a red surrounding zone of 2 or 3 millimeters in a day or two more. In this central part there develops by the fifth to seventh day an exudate which gives a grayish color to this vesicle or pustule. On about the seventh day the surrounding red zone suddenly begins a rapid spread, reaching its largest diameter eight to eleven days after vaccination, and it is this wide-spreading area, rather than the vesicle or pustule, that constitutes the most significant part of the process. A crust has meanwhile begun to form on the vesicle, and within a few hours after the greatest spread of the area has been reached the color becomes somewhat duller and a gradual fading of the area commences.

[1] Read at the 22nd Annual Meeting of the Association of Military Surgeons of the United States, Washington, D. C., May, 1922.

The changes from this picture when the subject, instead of being vaccinated for the first time, has already acquired some immunity, are in the direction of a hastening of the process and a lessening of its intensity. If the immunity is only moderate the first appearance of a "take" will be a day or two earlier, but the same course of papule, vesicle and area production will be followed, reaching its height three to seven days after vaccination. This has been called the accelerated reaction, or vaccinoid.

If the immunity is very high, vaccination will result only in the rapid production of the first stages of the process, usually without vesicle or true area formation, the redness and induration being greatest in twelve to seventy-two hours after insertion. It is the day of greatest extent of the redness which is the important criterion in differentiating these different reactions. This last, the mildest form of "take," is called the immediate reaction, or the reaction of immunity.

In general, the more recent the first vaccination the closer will the reaction after the revaccination approximate that last described, but individuals vary in the rate at which the immunity is lost, and the reaction will also vary with the potency of the virus used. To interpret these rapid and fleeting reactions as indicating substantial immunity a virus must be used which will give approximately 100 per cent success in primary vaccination.

A vaccine virus which is entirely dead, judged by its failure to produce a primary vaccinia on previously unvaccinated subjects, may frequently be capable of giving an immediate reaction (the immune reaction) when used for revaccination, and in some such cases a fully potent vaccine would go on to the production of an accelerated reaction. Thus though potent vaccine practically always gives a reaction, whether or not the subject is immune, one cannot judge of the potency of vaccine by the results in revaccination; subjects previously unvaccinated are necessary for such a test, and if the virus has been properly refrigerated, 100 per cent success should be obtained in every case.

It is to be regretted that more studies are not available, somewhat similar to those of Lieutenant Peterson[2] recording in detail the results of vaccination and revaccination. Such records should be kept in some such form as the following:

---

[2] Peterson, 1922, U. S. Naval Medical Bulletin, Vol. 16, No. 3, pp. 411-433.

SUMMARY OF RESULTS OF SMALLPOX VACCINATION:

Manufacturer of virus:..... Lot No..... Expiration date.....

Received from..... Address..... Date of receipt.....

Shipped by mail, express..... Method of packing.....

Temperature of storage..... Date of vaccination.....

	A Typical vaccinia (maximum redness in about 8–11 days).	*B* Modified vaccinia (maximum redness in about 3–7 days).	*C* Immediate reaction (*hour observation).	*D* Failures and unclassified results.	*E* Observation not completed.	*Total* number vaccinated (A+B+C D+E)
1. Typical scar present of vaccination within 3 yrs.....						
2. Typical scar present of vaccination over 3 yrs. ago.....						
3. History of smallpox.....						
4. Questionable scar of vaccination present....						
5. No scar present, history of successful vaccination.....						
6. No scar present, history of unsuccessful vaccination.						
7. No history or scar of previous immunization.....						
8. Totals.....						

* The number of hours after vaccination when the first observation is made is to be inserted here, as "40-hour," or "48-hour."

For such a record, it is necessary that one observation be made twenty-four to forty-eight hours after vaccination, and another about seven days after vaccination. It is to be noted that the various

classes are mutually exclusive; that is, a reaction should not be classed as immediate, even though clearly evident at the forty-eight-hour observation, if at the seven-day observation it is found that the maximum has occurred later than three days after vaccination.

Where the slight reactions of immunity are to be observed, it is necessary that a control site be traumatized in the same manner as the site or sites where the virus is inserted. By measuring or comparing the areas of redness and infiltration the true reactions of immunity can be differentiated from the reactions due to the trauma of scarification. The most convenient instrument in this case is the vaccination drill devised by Force. This drill has a sharp cutting edge 2 mm. in width, with square corners like a very small screw-driver. It is made of carbon steel and can be sterilized without affecting the temper of the edge. The drill is held between the thumb and middle finger, the forefinger pressing firmly on the upper edge of the handle and the little finger resting on the tightly stretched skin of the subject's arm, so that the pressure may be more accurately gauged. A single rotary turn is made while the drill is pressed perpendicularly against the skin with uniformly maintained pressure. If the pressure has been right there is no bleeding, but a small flake of epidermis is detached, which should be brushed off with the edge of the drill. This traumatism is more uniform in size and depth than can be obtained with other vaccination instruments in common use, and when the slight reactions of high immunity are to be read this assurance of uniformity between the control sites and the insertions is of great value. At the time of observation it is sometimes advisable to measure the diameter of the redness with a millimeter scale or calipers.

The degree of immunity is measured not by the degree of reaction at the twenty-four- or forty-eight-hour observation but by the promptness with which the reaction reaches its maximum, provided fully potent virus is used. In some cases the highest degree of immunity may coincide with very slight degrees of reaction. In case a high degree of immunity is expected, as for instance in subjects vaccinated within a year, the first observation should be made in twenty-four hours.

Much useless repetition of vaccination has been carried on through failure to observe and interpret the reactions of immunity. This has been pointed out particularly by Force.[3] If the subject has had smallpox or has been vaccinated before, the early observa-

[3]Force, John N., 1913: Calif. State Journ. of Med. Vol. 11, p. 290.

tion should be made as regularly as the later observation is made in first vaccinations.

Gins of Berlin has recently advised that revaccinations be performed with a "green"[4] extraordinarily potent virus, in the hope of securing an accelerated reaction (instead of a reaction of immunity) in every case. He did not believe that the latter reactions produced immunity, but rabbit experiments at Bern[5] have shown that the minimal reactions of revaccination may increase the already existing immunity. Moreover, it is clear from the German smallpox statistics[6] that, if attacked by smallpox, the persons who have been revaccinated and have given such a fleeting reaction that it was recorded as "unsuccessful" at the official seven-day inspection, are better protected from fatality than those who have had merely a successful primary vaccination. The first-mentioned class have even a slightly lower fatality than those recorded as revaccinated "successfully." In Germany 95 to 97 per cent of the infantile vaccinations are recorded as successful. The number of deaths, of cases, and the case mortality rate per cent for smallpox in Germany in 1917 among the unvaccinated, those vaccinated once successfully (at the age of 2 or less), those vaccinated and revaccinated successfully, and those whose revaccination (usually at the age of 12), was "unsuccessful," are as follows:

Age..... *Under* 1	1	2–9	10–19	20–29	30–39	40–49	50–59	60 *and over*	*Total*
Unvaccinated:									
Deaths..... 30	8	10	2	0	3	1	5	12	71
Cases..... 61	25	45	7	7	8	3	15	26	197
Fatality (%)..... 49	32	22	29	0	38	33	33	46	36
Vaccinated once successfully:									
Deaths..... 0	0	4	1	2	2	9	30	58	106
Cases..... 3	5	79	36	22	25	78	228	226	702
Fatality (%)..... 0	0	5	3	9	8	12	13	26	15
Revaccinated successfully:									
Deaths..... 0	0	0	1	0	4	17	42	42	106
Cases..... 0	0	9	52	108	158	396	418	169	1309
Fatality (%)..... 0	0	0	2	0	3	4	10	25	8.1
Revaccinated "without success":									
Deaths..... 0	0	0	1	1	4	1	2	5	14
Cases..... 0	0	1	17	16	24	52	44	35	189
Fatality (%)..... 0	0	0	6	6	17	2	5	14	7.4

This illustrates the increased protection secured by revaccination, even though the vaccination was recorded as "unsuccessful."

[4] A "green" virus is one which is used without artificial reduction of the bacterial content, as by glycerinization and storage.

[5] Sato, 1921: Zeitscher. f. Immun. Vol. 32, p. 481.

[6] Breger, 1921: Mediz. Stat. Mitt. a. d. Reichsgsdmt., Vol. 20, p. 207.

It is therefore unnecessary to use "green" vaccine for revaccination, and there are certain objections to its use. It is possible that in "green" virus concomitant organisms at times act on the skin in symbiosis with the pure vaccine virus and promote multiplication of the virus; at least the bacterial content of "green" virus is much higher than that of ordinary virus and the resulting "take" is more severe. Except in the immediate danger of smallpox the inconvenience and the very slight risk of these severe takes is inadvisable. In the same way the slightly increased immunity obtained by multiplying the number of insertions and by increasing their size is in general offset by the larger area exposed to extraneous infection. If circumstances render such increased immunity desirable it should not be obtained by the use of large insertions—several small insertions will be more perfectly protected by their overlying scabs and will heal more promptly than a single large insertion. The lesson needs to be learned that vaccination is a mild affair and the actual demonstration of this mildness is the best teacher. Practically perfect protection can be given by the mildest sort of vaccination, if repeated frequently enough, and improvement in that direction, reducing the general severity of the "takes," is preferable to a less frequent but more severe vaccination. Vaccination is like oil on a good machine—it should be applied little and often.

Prolonged glycerinization out of cold storage, however, has been found unnecessary to reduce the bacterial content of vaccine virus to proper limits, and is detrimental to the virus. The temperature factor is fully as important as that of time in causing deterioration in potency; the virus should be kept continuously prior to use at a temperature below freezing, except for the necessary time in transit. It cannot be kept too cold. Elgin[7] first showed that glycerinated virus can be stored at temperatures below freezing for long periods and retain its potency better than virus stored in any other way. Blaxall and Fremlin[8] kept glycerinated virus at the temperature of liquid air (—180° C., —290° F.) for eleven weeks without impairing its potency. In the absence of facilities for storage below freezing, vaccine virus should be stored, not merely in the ice-chest, but in a metal or glass container which is kept constantly in contact with the ice; by this means a temperature below 5° C. may be maintained. Virus properly stored should give 100 per cent success when small insertions are made on previously unvaccinated subjects; this high

[7]Elgin, W. F.: 1900, Am. Pub. Health Assn. Reports, vol. 26, p. 80; 1905, *Ibid.*, vol. 30, p. 204; 1906, *Ibid.*, vol. 31, p. 235.

[8]Blaxall and Fremlin: 1908, Report of Med. Off. to Local Govt. Board for 1906-1907, Appendix C.

potency should be demanded. Failure may be fatal in the presence of virulent smallpox.

IMMUNITY TO VARIOLA

It is generally assumed, and there is no evidence to the contrary, that variations in immunity to variola are parallel with variations in immunity to vaccinia. In fact there is some evidence that persons who are susceptible to repeated attacks of smallpox also tend to lose rapidly their resistance to vaccination, so that such persons give fully successful "takes" on revaccination soon after the first immunization. But a positive result from a good vaccination is much more certain than a positive result from natural exposure to smallpox; that is, immunity to naturally acquired smallpox is in general higher than immunity to vaccination.

Recent successful vaccination with a potent virus is a certain protection in case of a subsequent exposure to smallpox in nearly every instance; successful vaccination for this purpose includes not only a primary vaccinia with a nine-day maximum, but all the forms of accelerated and immediate reaction in the revaccinated. We do not need to go back to the early days of vaccination for experimental proof of this. Our present-day vaccine is fully as efficient as that of former days, and the percentage of protection against smallpox is as high in the vaccinated now as it ever was. In April, 1902, smallpox broke out in a Burmese village[9] where inoculation with variola was still practiced. Fifty-nine people were attacked, including 37 children whose attack was by intentional inoculation; there were 5 deaths, none among the inoculated. The population of the village was about 1,500, of whom 144 had been successfully vaccinated within the preceding two years; 123 of the latter were inoculated with smallpox during the epidemic, without result. None of the other 21 vaccinated persons acquired smallpox.

A population which has been successfully vaccinated at least once after infancy has a high degree of protection against the mild form of smallpox as it is ordinarily found in America, and the more thorough the vaccination the greater the protection against all forms of smallpox. A distinction should be made between individual protection and community protection. An immunity which would be quite sufficient to protect an individual against chance exposure in a well-vaccinated community is inadequate in a poorly vaccinated community where the exposure may be intense and con-

[9]Fink: 1904, Brit. Med. Journ. vol. 2, p. 124.

tinual. Vaccination therefore becomes a community affair, and we are directly concerned in the vaccinal status of our neighbors.

In general, as has been said, the protection against smallpox conferred by vaccination is greater than the protection against vaccination itself, but there are certain things that vaccination will not do. The protection conferred even by recent vaccination against the hemorrhagic form of smallpox, though definite when the incidence and death rate among the unvaccinated is taken into consideration, is by no means as certain as the protection against the severe discrete and the confluent forms of the disease. This is illustrated by the cases reported by Captain Riggs[10] in which the exposure was to a virulent Chinese strain of smallpox. Three fatal hemorrhagic cases occurred in spite of vaccination within a year; in one purpuric case the patient had also had a prior attack of smallpox. Even the mild West Indian strain of smallpox, which has been disguised under various names, may attack a person vaccinated four weeks previously and showing three good recent scars of vaccinia.[11]

The immunity obtained from vaccination is slower in becoming established than commonly supposed. The vaccination must be performed prior to exposure and the acme of the reaction reached and passed if protection is to be counted on.

Vaccination and even revaccination with multiple scars is not a certain protection against smallpox. In Kansas City during the recent virulent outbreak I found two cases, both mild, in persons who had been successfully vaccinated within three years and showed good scars from the vaccination. Of the 226 cases in Hamburg in 1917, the majority were among the vaccinated;[12] in Germany about 80 per cent of the children are vaccinated before the age of 2 and about 90 per cent are revaccinated before the age of 12. In Dresden in 1918–19[13] there were 865 cases and 122 deaths. Some of the persons attacked had been vaccinated with success two years previously, but the heaviest incidence was in the 41–50 year age group in females, that is, in those who had lost the protection of the revaccination at twelve years of age and had not had the advantage of adult revaccination in the army. There was a 4 per cent fatality among those vaccinated 3 to 5 years previously, as contrasted with a general fatality of 14 per cent. While the number of vaccination

[10] Riggs: 1918, Military Surgeon, vol. 43, p. 485.
[11] Seheult: 1908, Proc. Roy. Soc. Med., vol. i, Epidemiological Section, p. 284.
[12] Paschen: 1919, Hyg. Rund., vol. 29, p. 270.
[13] Plange: 1920, Zeitsch. f. Med. Beamte, vol. 33, p. 112.

scars had some inverse relation to fatality, it was not enough to show any great advantage in multiplying the number of insertions at any one time; a much greater security was obtained by recent revaccination. There was 9.9 per cent fatality among those showing 1 to 3 scars, 6.3 per cent among those showing 4 to 6 scars, and 4.1 per cent among those with 7 or more scars; and it is to be noted that those with the greater number of scars are likely to have been the most recently vaccinated. The incidence of the hemorrhagic cases in this outbreak seemed to bear little relation to the number of scars. There were 93 hemorrhagic cases among the vaccinated and none among the unvaccinated. During the smallpox outbreak in Berlin in 1917[14] the one-fifth of the population who were over 40 years of age furnished four-fifths of the cases. Revaccination of the older people was not carried out; such revaccination is necessary to quell promptly a serious smallpox outbreak.

All of this shows that vaccination has its limitations which should be kept clearly in mind. There is no procedure which will give absolutely uniform and perfect protection, but the incidence of the disease may be greatly diminished—to practically zero by recent vaccination. We should endeavor to make vaccination a mild, but a thorough procedure, by the use of fresh virus and small insertions. The virus should be kept below freezing if possible. The goal of protection is not to be expected from a more virulent lymph, a greater number of scars, or a larger area of vaccination, but by thorough revaccination when exposure to smallpox is threatened.

---

[14] Gins: 1919, Deutsch. med. Wchnschr., vol. 45, p. 661.

THE TUBERCULOUS EX-SERVICE MAN AND THE MEDICAL RESERVE CORPS OFFICER[1]

By Major R. McBRAYER
Medical Officers' Reserve Corps, United States Army

THE TITLE of this paper probably causes you to recall the many articles and discussions that have come before the medical profession since November 11, 1918. Hardly any of these ideas, plans and teachings have been based on experience with this specific problem; therefore they have at times been unpractical, flighty, idealistic and militaristic; even some writers have wanted us to attempt the impossible, the latter being all the way from virtually no care at all for the tuberculous ex-service man to plans that were obviously impossible. The guiding hand of such men as our Colonel Bushnell, Dr. Lyman, Dr. L. B. McBrayer, Surgeon General Cummins, and many others, has been felt during these four and a half years, and restrospection now allows us to visualize their ideas as material buildings, definite policies, and good results. The unlimited amount of criticism (mostly the most damning of all criticism—destructive criticism) directed against all parties and peoples concerned with the problem (and such a word is most properly used) of handling the tuberculous ex-service man has come from those who could not appreciate the psychology of all concerned, and who knew nothing of the factor of time in the solution of and the necessary material equipment for handling this immense business, for it is no less than a gigantic undertaking, which, unfortunately, did not even have a prototype in the medical world.

The writer desires to have this contribution considered as one based on our four and a half years' experience, which, when properly analyzed and catalogued, becomes knowledge of our problem; therefore let us discuss some of the individual obstacles or hindrances that have been met, appreciated, and in general correctly surmounted.

1. *Obviously the Diagnosis.*—Let me remind you that this was peculiarly difficult for all except the very few true specialists (and they had their misgivings about many cases). This difficulty existed because of (1) a very recent epidemic of measles and influenza, (2) the warfare gases, (3) the inevitable war neuroses, and (4) the now recognized compensation complex. The medical men of this

[1]Read at the Meeting of the Medical Society of the State of North Carolina, Asheville, April 19, 1923.

age have never been confronted with such difficult differential diagnosis as we had in this ex-service man. Necessarily, then, many of them were not diagnosed tuberculosis until they had been sick with it several to many months. This, of course, resulted in much dissatisfaction in the ex-service man and the layman, as well as the doctor.

I feel sure that society is being, and will continue to be, amply repaid for any loss accrued by the unpreparedness of the medical profession in this work, because these trying and most difficult diagnoses have been true and lasting stimuli to the medical profession with the result that the differential diagnosis of incipient pulmonary tuberculosis is more completely, scientifically and accurately determined now than it would have been in many more years had it not been for this virtual baptism of fire. So the net results in diagnosis are decided assets to the layman, the ex-service man, and the medical profession.

2. *Treatment.*—For discussion we can divide this into its three essential components: (1) A tuberculous ex-service man who truly wants to get well; (2) proper diagnosis (or diagnoses, as is more frequently the case) and treatment; (3) a place (sanatorium) where these may be accomplished. This absolutely necessary triad can truly be likened unto the proverbial chain whose strength (power for accomplishment) is no stronger than its weakest link.

1. A tuberculosis ex-service man who truly wants to get well. Here the patient's lack of knowledge of the requirements for this task resulted in our having very few patients who appreciated the long-drawn-out years of self-denial, sanatorium treatment and aftercare necessary for the accomplishment of the task. In other words, we had very few patients who, from a standpoint of prognosis, were good patients. Appreciating this difficulty early in our efforts, its correction was promptly undertaken. This could only be corrected by education of the patients. In that getting well of tuberculosis is such a difficult, monotonous, and long endeavor, requiring most rigid self-discipline (which in itself frequently requires re- if not complete education of that very evasive mental faculty, the volition), many hours of the "blues" and homesickness, undreamed-of tenacity, and, withal, an optimistic temperament — on the patient's part, this education obviously could not be acquired in less than a few years. It is to be regretted that many of our ex-service men demanded that they go to the school of experience to learn these requirements rather than learning them from such

eminent teachers as our own Dr. Ben K. Hays, whose equal as a teacher in this particular school probably does not exist.

This school of experience I like to refer to as the devil's own school, because its net results are the untimely, obviously unnecessary loss of life with its attendant economic loss and personal grief and heartaches. This particular group of patients was exceedingly hard to educate, either in the didactic and precept school or even in the devil's own school, because of two facts: (1) This group was composed of very viable, energetic and ambitious young men who were only yesterday practically America's flower; (2) they were in general accustomed to proper military discipline and control during war. This latter was suddenly removed with its consequent normal psychologic reaction thereto. The former was the antithesis of a sick man. Time—much time—was an absolute necessity in this education, though the citizens of our country so meagerly realized it that they became very impatient, even rebellious in many instances, and unmistakably placed the total blame for delay on the buildings and those directly and indirectly responsible for treatment and after care. Unfortunately the necessity for education was not limited to the patients. The home folks—the loved ones and the real, though ignorant, friends soon became, at least in numerous instances, the worst enemies the patients had. When this love and friendship was actively interested in the patient's welfare, he frequently left the hospital on ignorant, therefore virtually malicious, advice; or, if he did remain where placed by the Government, he was disgruntled, dissatisfied, and many times took active steps to tear down what the Government had provided and planned to provide for his restoration to health and useful citizenship. This attitude and these acts are exactly opposed to those which are so essential to a favorable prognosis. Let me repeat that before we could get an ex-service man well of tuberculosis we had to teach his loved ones and friends the absolute requirements for getting him well, or else, next to the patient, they remained his greatest enemies in his fight for life. Obviously this has required and even will require years, and in a very large degree the completeness of this education will show itself in cured cases of tuberculosis.

I must not leave this very important link in the proper care of the tuberculous ex-service men without asking you to substitute the words "American Legion" for the word "friends" in the preceding paragraph. I most earnestly agree with the majority of our

national authorities in this particular line of medical work when they say that at many times and in many places the American Legion (including the national, state and local organizations) has most seriously interfered with the proper care of the tuberculous ex-service man, and thereby has been a real and active enemy to his life. This organization is a logical, proper and praiseworthy one, from which much material benefit has been and will be derived in numerous ways, though when it attempts to dictate or even suggest means and methods for solving problems about which it is densely ignorant, it is a greater power for evil than it ever can be for good. This causes me to repeat the line: "Oh! the dangers of an ignorant friend's advice." I repeat that a tuberculous ex-service man who truly and intelligently wants to get well is an absolute essential to successful treatment and care; therefore such a patient, and none other, is necessary for the proper accomplishment of this gigantic and terribly expensive problem—which in dollars alone is costing us a very large part of more than one million dollars per day.

Now to the second essential in successful treatment—namely, proper diagnosis or, as I said above, more frequently diagnoses, and the actual treatment of the case. Several factors militated against this accomplishment in the first few years following the armistice (which my ability to reason tells me—and I am not alone in this opinion—came before we had accomplished our mission): (1) Specialists in this field were so few that hardly any were available for Government service, therefore they had to be made, and certainly no one can dare claim to be an authority in this field with less than five years' actual bedside handling of at least 100 cases daily, and that in a well-regulated, well-managed, completely equipped and properly staffed sanatorium. This meant that the tuberculous ex-service man could, by comparison, arrive at the conclusion that he was placed by the Government in a sanatorium where he was not getting as good a medical service as obtained in some other sanatoria. Obviously this bred dissatisfaction, though the conditions were not humanly avoidable. (2) The specialist in pulmonary tuberculosis is relatively helpless without the constant aid of specially trained men in other fields, because frequent cystoscopy, the surgeon, the real internist, the laboratory director and others are absolutely necessary to the correct diagnoses and treatments very frequently seen as complications in pulmonary tuberculosis, and which at times so very closely simulate it that

an incorrect diagnosis is not infrequently made, and as a result thereof the patient is treated for months for pulmonary tuberculosis when such actually does not exist. Only in the last few months I have seen the following diagnosed active pulmonary tuberculosis, when painstaking work and several weeks' observation have proved them to be non-tuberculous: carcinoma of pancreas with metastasis to lungs, chronic bronchitis, lung abscess, syphilitic pneumonitis, pulmonary infarct, bronchiectasis, unresolved broncho-pneumonia, nonspecific pneumonitis, alveolar (root) abscesses, pernicious anemia, chlorosis, Hodgkin's disease, chronic cholecystitis, hyperthroidism, chronic tonsillitis, tertiary syphilis with hypertension, hookworm disease, hematemesis in first few weeks of pregnancy, chronic sinusitis, chronic pyelitis, and actinomycosis. Obviously proper staffing and equipping of our sanatoria was very difficult and necessarily required several years. This was because of several factors: first (as I have already stated) the very limited supply of trained men in this field; second, the salaries were and are very meager compared to what men of this experience and caliber have as civil incomes; third, probably an uncertain position; fourth, the red tape between this specially trained man and the necessary equipment, facilities and personnel for the full appreciation and realization of his ability; fifth, the very frequently changing administrations, bureau chiefs, etc., which were more or less menaces to his position and professional standing; sixth, because any patient could send in a complaint to his senator, the American Legion, and many others, thereby causing the specialist to be brought unmercifully and unnecessarily into the embarrassing limelight of unjust criticism where he had to defend his opinions and acts against the person who knew absolutely nothing about the subject he caused to be investigated. I say all honor and respect to such men as Dr. Montgomery at Oteen and many others who have braved what seemed at times the impossible, in an honest effort to give to the tuberculous ex-service man what he so richly deserves.

I need not remind you that the tuberculosis specialist has no smooth sailing in administering treatment. Very seldom do we see a patient who needs treatment only for his pulmonary lesion, and just here much experience, scientific training, and art are required—much more than the salaries offered can demand. By no means least of all—in fact, ranking near the first of the specialist's requirements—comes the disciplinarian. Remembering the above-mentioned psychologic reaction to discipline seen in the ex-

service man, an exceptional, if not superhuman, doctor was required to handle these patients, and because, in many instances, where necessary discipline—so essential in the successful treatment of tuberculous patients—has not been possible, the patient has died as a result, when his pathologic process was such that an absolute cure was the correct prognosis.

Regarding the third essential in treatment—namely, a place where the specialist, with his armamentarium, and the patient can get together under proper conditions—I am afraid that most of us had (and many still have) the very fixed, though erroneous idea that marble halls, courtly entertainment, spacious sleeping porches, myriads of nurses, doctors and medicines, beautiful social service workers, taste-bud tickling banquets three times per day, and a neat financial income were essentials in the treatment of tuberculosis. At least the tuberculous ex-service man and his host of known and unknown friends demanded these things for him. I do not deny the place these things have in his cure-taking, but they are at least very subsidiary and many of them not even needed. The lessons taught and examples set by that great Trudeau are correct today. Plenty of fresh air is essential, but it matters not that we go on a sleeping porch to get it or have it come into a room to us through windows and doors. The feast three times a day is doubtless damaging, because years ago we learned the hurts of overeating and forced feeding in all febrile diseases, and especially in one where gastric digestion, and doubtless liver function, are slightly to seriously impaired, and in which disease nitrogen balance is an important factor, rather than the additional and unnecessary respiratory ventilation which is demanded of one on a high protein intake, not to mention the colloidoclasia of Widal and the resulting constant bombardment of the kidney with incompletely split, therefore foreign, proteins with its inevitable result.

I deeply regret that it is absolutely necessary that we have such large numbers of patients in one sanatorium, because intimate and very personal knowledge of and contact with the patient is decreased, as a rule, proportional to the number of patients. This logically results in the following psychology in the patient: "I am not getting anything here that I cannot get at home, therefore I will do as well at home. Since I much prefer to be there, and can do just as well there, I'll leave the sanatorium to go home." To prevent this the ex-service man—even all tuberculous patients—must be able to visualize the medical service's doing for him what

he cannot get outside the sanatorium. Only the doctor who is an applied psychologist can successfully cope with this problem, which is one that is constantly and daily met with in this work, and which, as a rule, is less in actual accomplishment the larger the sanatorium.

In the preceding pages I have attempted to stress some of the phases of the proper handling of the tuberculous ex-service man, as we now can appreciate them by experience and retrospection. Throughout, I have tried to stress the necessity for education which all parties, directly and indirectly concerned, must acquire before this work can accomplish for the tuberculous ex-service man its rightfully expected, therefore demanded, amount of success.

I hold that the Medical Reserve Corps officer is in a most advantageous position to be a provider of this required education. He is at home with the loved ones and friends; he knows the home town ex-service man by name; he is living the life of a civilian, though officially connected with the medical service of the Federal Government; as a rule he is most sympathetic because he has soldiered with the ex-service man; he appreciates keenly the post-war psychology of these patients; he is a leader in his community; he appreciates the medical side of this work; he is a voter; he knows, at least by his army service, the necessity for team work, with its many and various requirements.

I insist that we Medical Reserve Corps Officers are especially obligated to render this great and life-saving service to our tuberculous ex-service men.

REPORT OF AN OBSERVATION TRIP IN GERMANY, DENMARK AND ENGLAND

By M. A. REASONER
Major, Medical Corps, United States Army

SANITATION

AS A RULE the sanitary conditions around the German universities were quite good. The university buildings at Jena appeared to me to be quite well cared for and much like one of our own universities. Heidelberg, on the contrary, is housed in old buildings which are difficult to keep in presentable condition. The buildings occupied by the Kliniks at Bonn are somewhat better, while the Kaiser Wilhelm Akademie in Berlin is in an exceptionally fine building which was formerly the Army Medical School and served all the purposes of a medical school as well as a residence for the students. I noticed, in the Klinik grounds at Jena, an old manure pile which was evidently a permanent affair. This manure pile was located in a small roadway leading between what was evidently a stable and the Surgical Klinik. The operating rooms were on the second floor directly above the manure pile, but there were no screens visible upon this or other buildings. Going a little closer, I noticed a number of rats running in and out from under the stable and counted five in all. They had evidently not been bothered and paid little attention to me.

The cities and towns of Germany, for the most part, date back to the time when as a measure of self-protection it was necessary to live either in walled cities or very closely together. As a result of this manner of life, they have become habituated to conditions which are to us offensive and disagreeable. The automobile has not yet assumed so important a place, and the manure pile is always evident though not perhaps so obviously as in France. Even under these conditions the flies are not so numerous as one would expect. Typhoid fever is usually present to a greater or less degree, and frequently in the form of epidemics. There is not so much attention paid to a "carrier" as with us, and the average German physician is not so capable of handling an epidemic as one would expect. There are a number of laws and regulations of greater or less antiquity which must be observed, and it sometimes appeared that they were more intent in carrying out these regulations and making the necessary reports than in quickly finding the cause and taking summary

measures to prevent the further spread of the disease. In Coblenz and the surrounding area it was several times necessary for the American authorities to compel the Kreis physicians to carry out the measures which with us are ordinarily considered as routine.

If a German town is large enough to have a common water supply, it is usually good and taken care of in a scientific manner. Otherwise, they use shallow wells and the water is usually bad.

Throughout Germany a very common method of taking care of urinals is to cover up the smell of the decomposed urine with some antiseptic or other material which has a still stronger smell. In England I happened to see two instances where urinals were actually being scrubbed. I never happened to see this in Germany. I observed many urinals which needed it.

In the Hygenic Museum in Dresden were some approved outfits for taking care of the new-born infant. Among other things there were two specimen models of that abomination, the infant pacifier, one of celluloid and one of soft rubber. This museum is supposed to show the best and latest developments in hygiene, and it speaks very poorly for the standard of the medical profession that it would permit such a thing.

The food served in the German hospitals, especially at the present time, is very simple and limited. Little sugar is used but mainly black bread, soup and a little meat. The meat question is important in many parts of Germany, especially the Rhineland. Here the country is so thickly settled that there is no pasturage. Much of the ground is broken and uneven and given over to vineyards, while in the level areas the ground owned by the peasants is so small that they are compelled to keep such animals as they may have in small stone or brick sheds. They use their cows as beasts of burden as a measure of economy. So long as they have one cow, since it is difficult to raise a calf to maturity, they are sold to the abbatoir as soon as possible. Due to the falling price of the mark, it is difficult to lay in a supply of forage for winter feeding. On one day at the Coblenz abbatoir, I counted 125 young calves brought in by the peasants for sale and slaughter. The shortage of milk and beef in this locality must, therefore, be laid to economic conditions rather than to replacements to France and Belgium.

For some time the law in Germany has permitted the sale of the meat of diseased animals over what is called the "freibank." For instance, hogs suffering from *schweinsucht* or contagious pneumonia as well as other diseases are hurried off to the abbatoir and slaughtered as soon as possible. Horses and cows suffering from

various ailments or due to die from old age are transported in a wagon they have for the purpose, and their meat, with that of tuberculous animals, is sold over the "freibank." These sales are only made with the permission of the superintendent, and sometimes it is required that the meat be cooked before selling, or only certain parts are sold. It is only sold to those having the necessary cards showing that they are in destitute circumstances and no one is permitted to purchase over two kilos, or even less if the supply is not great enough to go around. I do not believe that this meat ever falls into the hands of dealers or hotels as the law is very strict upon this point, and if one of these were discovered using such meat, he would not only be punished but his license would be taken away from him. The meat which has passed the inspection is stamped in a number of places so that it may be easily recognized. However, the best meat is not what we would call first grade. The animals are poorly nourished and generally in a filthy condition. This is due to their having been shut up in the small sheds mentioned above.

I saw one case where it was desired to take an old cow to the abbatoir. This cow had been so long confined in a small shed that it was impossible for her to walk the couple of miles distance, and it was necessary to secure the wagon. Upon the sides and rumps of this cow the old dried manure was apparently an inch thick. In the northern part of Germany which is not so thickly settled, I quite enjoyed seeing considerable numbers of fine-looking cattle and white pigs grazing free in the fields. In some parts of southern Germany one occasionally finds the same conditions. While serving as sanitary inspector in the Coblenz area, I had occasion to criticise the manner in which one of the institutions under our control took care of its pigs. It was impossible to convince them that the pigs would not die if allowed out in the sunlight and open air, and it was finally found necessary to insist that they be disposed of.

The Germans do not use a modern type of ice box. It is a zinc or galvanized iron-lined box with the lid upon the top. The ice is put in first and then covered with towels and the food laid upon the towels. To clean the box, it is necessary to take everything out, which results in some waste, and as a consequence this is generally put off as long as possible. The towels are frequently used for a week and perhaps not thoroughly cleaned when they are washed. In Coblenz it was found that the German hotels and restaurants would not keep their ice boxes clean unless compelled to do so. As a rule, they were about as careful in looking after their hotel kitchens as in the United States.

Their practice of sewage disposal is about on the same standard as in the United States.

Fly-screens are not very common in Germany, but they are in use by many of the better classes. While in the National Seruminstitute at Copenhagen, I noticed some small test tubes over the free ends of some pipets. The explanation given was that this was done to keep the flies away from the ends which must be taken in the mouth. In reply to my question, they stated that there are many flies there during the summer but that screens and fly-swatters are not used in Denmark, only flypaper. This seemed strange in view of the fact that this was the most atractive and best equipped laboratory I have ever seen. They also stated that there is very little typhoid fever in Denmark. They have small epidemics from time to time but are always able to control them. There are some "carriers" in the country, but the population is so small that it is possible to keep track of them and see that they do not engage in improper occupations. Except in the small villages and in the country, the water supply is always obtained from deep wells. They also told me that in this laboratory the typhoid vaccine for the entire country is made. They do not make more than one liter at a time. It is heated from 63 to 73° C. so as to kill all organisms, and as a preservative they use 0.5 phenol. There are many culex mosquitoes but no anopheles and no malaria. There is an adequate milk control, and all cows are tested for tuberculosis. This latter procedure is also well carried out in Germany.

I was down in "Petticoat Lane" in London one Sunday morning and heard a vendor giving a talk on birth control and selling pamphlets giving all the secrets connected therewith. I noticed in the windows of the shops various articles which seemed to be well advertised. In one window alone I counted the following:

7 books on birth control, sexual intercourse, etc.
6 types of vaginal syringes, whirling sprays, etc.
1 type quinine pessary or suppository.
1 Poor Man's Friend sheath or condom.
1 type female sheath or protective pessary.
1 common type of sheath or condom.
1 tablet for making antiseptic solution.
1 sexual invigorator tablet.

This particular window was filled with this class of articles, and apparently there is no law against it or, if so, it is not enforced. The present economic conditions in London and England are so bad and there is so much unemployment and such a lack of housing

facilities that it serves to some extent as an excuse. Unfortunately for the good of the country, it gets the people into bad habits, and if this keeps up, they bid fair to rival the French.

The public or common drinking cups seem to be still in favor in the parks and other public places in London.

In no place in Europe have I seen so many bleary-eyed, besotted wrecks of humanity as in London. If there were no other evidence available, the manner in which they take their alcohol and the effects produced upon them would be sufficient to show, beyond doubt, the presence of racial differences.

HOSPITALS AND MEDICAL SCHOOLS

The buildings of a German university are frequently scattered over various parts of the city, but the clinics and the medical schools are usually together. It is the custom to have separate buildings for the following specialities: Surgery, Medicine, Gynecology and Obstetrics, Skin and Venereal Diseases, Eye, Ear, Nose and Throat, and Nervous Diseases. They do not have a central laboratory but each department has its own laboratory, which seems to us a mistake. The Surgical Department, for instance, works up all tissues obtained at operations, while the Department of Pathology handles exclusively the tissues obtained at necropsies. The latter becomes a function of the school and not of the hospital. It is the German law that the family of a person who has died in the hospital must make a statement within eight hours that they do not wish a post-mortem examination performed, or otherwise it usually is carried out and in a very thorough manner. I have heard of particularly interesting cases where the family did not obtain news of the death until after the eight hours had elapsed. Instead of having one central X-Ray Laboratory, they generally have apparatus in both the medical and surgical wards. The buildings are usually built separate and with no direct connection, covered or otherwise, and these separate departments seem to function, each without very much attention to the other. There is, of course, the Director, who has general control over the employees and supply, but otherwise the Chief of the Service seems to be the most important person. It would seem that for the best interests of all concerned, both patient and physician, our method is preferable.

The German hospital beds are somewhat different from ours in a minor way only. They have as an integral portion of the spring, a section which may be readily elevated so as to place the patient in a semi-reclining position at any angle up to 45 degrees. It is con-

venient and easily manipulated. The springs are much like ours but not mechanically so well constructed. In the foot-piece is a board which can be easily removed and thus obtain extension of a limb and give better access to it. They say also that it keeps the feet warmer. I saw at Frankfort a number of small lifting trucks which run under a bed, and after the bed is lifted a few inches from the floor it can be readily transported to any part of the hospital much easier than moving a patient to a litter and back again.

The Stadtisches Frankenhaus in Dresden was once a royal palace, and consequently it is a little difficult and expensive to heat. There are at the present time (May 10, 1923), about 750 patients, which is about 150 less than the number one year ago. Due to the present economic conditions, the number of patients in the German hospitals has fallen off all the way from 20 to 40 per cent. The newer buildings, which are erected in the central quadrangle, are without connection one with another. In most of the municipal hospitals of Germany, in the Venereal Department, is a section for the confinement and care of diseased prostitutes where they are held until cured.

Copenhagen is a city of much interest, not only to the average traveler but to the medical man as well. I saw the Rigshospitalet which is located within the city, the Bispebjaerg Hospital out toward the edge of the city, and the Seruminstitute. During 1922, the Rigshospitalet averaged 648 patients, which is, however, not the full capacity. The hospital is arranged much as are the German hospitals. It has several differences in that there is a central X-Ray Laboratory and an Obstetrical Ward, to which all women having illegitimate children are admitted free of charge. Others may enter upon payment. During the year 1921 there were 1,916 patients handled in this building. Dr. Orskew at the Rigshospitalet was most courteous and kind. In the temporary absence of the Chief of the Service, he was in charge of Skin and Venereal Diseases. English is spoken quite generally by the physicians in Copenhagen, their standards are unusually high and much good surgery and medical work are being done there. All of the hospitals are beautifully equipped and do not seem to suffer for the want of anything. Coming directly from Germany, I was especially impressed with this fact. I was struck by the amount of copper and brass in the kitchens and laboratories and throughout the hospitals, all of it beautifully polished. For instance, I saw a brass tripod in one of the laboratories, such a one as we always make of iron. The clinic mentioned above is a large one and, as is to be expected with a thin

and sensitive skinned race, one finds a greater percentage of skin diseases to consist of eczema, scabes, psoriasis, and dermatitis of various kinds in the order listed.

The Bispebjaerg Hospital is the best I have seen, both in construction and equipment. It has a capacity of 750 patients and handles only medical and surgical cases. There are underground passageways between the buildings and the walls are thick and hollow. Two floors of each building are used for patients. The floors are usually covered with linoleum which is inset and glued to the concrete. At this hospital is a central laundry for all the hospitals in Copenhagen. This hospital has a large central laboratory, the major portion of which seemed to consist of an autopsy room. There are, however, small laboratories in each of the other buildings. They are used mainly for blood counts, urine examinations, etc. The kitchen is large and well equipped but has nothing which is new to us. The food is carried in cans through the underground passages to the other buildings. I believe that the Marmite cans (similar to a Thermos bottle), as used in the Station Hospital at Coblenz, are superior to any other method I have seen for transporting food from a central kitchen to scattered wards.

VENEREAL DISEASES AND LABORATORIES

Speyer House in Frankfort is the research laboratory where Ehrlich did his most important work and is now under the direction of Professor Kolle. They have been working under a grant from Meister, Lucius and Brunning, but since the French have seized that establishment and all the contained products, it is very doubtful if the assistance will continue to the same extent. It was in this laboratory that salvarsan and allied products were developed by Ehrlich. It has also served as a research laboratory for Meister, Lucius and Brunning. There were more signs of activity here than at any other laboratory in Germany.

While not entirely new, their work on acid fast bacilli is very interesting. They have secured a number of strains which they have inoculated into guinea-pigs through a series of transfers. The first pigs are not particularly affected, but in a few months or after a number of transfers, these organisms become virulent, the pigs die and the omentum and mesenteric glands are found to be involved as in tuberculosis. These strains, which at first grow luxuriantly upon glycerin agar, lose this characteristic after becoming virulent for the pigs. It was also noted that where they had been given

small amounts of tyberculin (old) they died more readily than the normal controls.

Their method of inoculating rabbits with syphilis is to place a small section of infected tissue in a pocket beneath the scrotal skin. They believe that in this way they secure more standard results, and this is probably true. They state that the lesion generally appears in fourteen days. In from twenty to thirty days an open chancre develops in 75 per cent of the rabbits. They are not inclined to believe in the "nervous strain" theory but are not willing to deny the possibility. They do not think they see much difference in strains. Their strains, however, were not such as would bring out these points.

During the last few months they have developed a new organic compound of arsenic which they think gives some promise in the treatment of syphilis. The exact formula has not yet been worked out. Prof. Herxheimer has used it in a number of cases and believes it to be of value. In their work on the development of new arsenical compounds for the treatment of syphilis, they still use Trypanosoma Brucci, Sp. recurrentis and syphilitic rabbits. For other than arsenical compounds, they have to depend mainly upon the rabbit.

In Prof. Herxheimer's wards for children, there were only six with gonorrhea. He thinks there are many more in Frankfort but they are prevented by economic conditions from entering the hospital and, as a consequence, many are receiving no treatment. His estimate, which may be high, is as follows:

Population of Frankfort	500,000
Number of cases of gonorrhea	50,000
Number of children affected	2,000

It is interesting to note that, while in some of these young females it is difficult or impossible to eradicate the gonococcus, yet when these chronic cases reach the age of puberty, they seem to clear up without further treatment.

In the Frankfort Stadtisches Krankenhaus, silver arsphenamin is used almost exclusively in routine work. Prof. Altmann, who has charge of the venereal wards, stated that he had had no deaths and no severe reactions from silver arsphenamin. In Dresden, they stated that they had had no severe reactions where they had administered the silver salt themselves, but a number of cases had come in from the outside. They were unable to explain why these reactions should come from the outside and none appear in their own wards. In Dresden, they give about twenty doses daily. Here, on account of its greater cost, they are only giving silver arsphenamin

in new cases and those with nervous involvement. In all others they are using neoarsphenamin.

Prof. Altmann stated that in female gonorrhea where the cervix is not affected, they are generally able to obtain a clean smear in six weeks. Colonel Harrison of London says that he is unable to obtain such good results, nor were we able to do so at the Bendorf Frauenanstalt near Colbenz. In case of involvement of the cervix, Prof. Altmann treats it with a 2 per cent solution of iodine upon a cotton swab. This is allowed to remain for two minutes when, if not forced out, it is withdrawn.

The following reactions are used in the Spyer House Laboratory:

Wassermann (old) with one to three antigens, one of them cholesterinized.
Sachs—Georgi.
Meinicke (3rd modification).
Readings at one, two and three hours.

They believe the Meinicke to be more delicate but less specific. In Copenhagen, and in Colonel Harrison's laboratory in London, the Meinicke has been discarded as not being reliable.

They are still carrying on cancer research work at both Frankfort and Bonn. In Bonn it is mainly concerned with the experimental production of cancer in white mice. As usual, this is done by repeated applications of tar or liquid paraffin to a designated spot upon the skin of the mouse. I am rather of the impression that they are working upon some other phase of the work in Frankfort but was not informed and in fact did not ask as to the nature of it.

The Department of Pathology at Frankfort is under the direction of Prof. Fisher, who is an unusually competent man. He has an entire building devoted to this work. It includes the large autopsy rooms and amphitheater. His museum is along the lines of general pathology, the best of the several I happened to see. Of course Prof. Koch, at the Kaiser Wilhelm Akademie in Berlin, has what is probably the best museum of gunshot wounds and war diseases, though there is much of interest to the surgeon, the internist and the general pathologist. He has a wonderful collection of specimens showing the various pathological conditions of the lungs and pleural cavities. In preparing these specimens, the body is injected with a 15 or 20 per cent solution of formalin and allowed to stand for one day. Then all the tissues and appendages are removed down to the thorax. This is split open, cutting the bones with a saw and the tisues with a long, sharp knife. The

organs all remain "in situ." The cut sections are then allowed to remain for eight days in 10 per cent formalin. The sections showing the entire thorax and the relations and gross pathological conditions of the lungs, heart, pleura, etc., are then mounted in Kaiserling's solution. For purposes of instruction, such specimens are most valuable. He has also a good collection of hearts, but I doubt if as complete as that of Prof. Fisher in Frankfort. Among other things, they have a heart found in systole and another in disastole. The collection and wax models showing the results of the various gases are very fine.

I called upon Prof. Harrison at the Ministry of Health in London, where I was received most graciously and invited to attend the free clinic at St. Thomas' Hospital, as well as to visit the laboratory at St. Thomas' Medical School where the Sigma or Dreyer-Ward test is being tried out in conjunction with the Wassermann and Sachs-Georgi. It should be stated that the League of Nations has apparently taken over the work of developing certain international medical standards such as diphtheria antitoxin and a standard simplified test for the laboratory diagnosis of syphilis. This Dreyer-Ward test is being studied at Wien, in Prof. Wassermann's laboratory in Berlin, in Warsaw, in Brussels, in Heidelberg and in the Seruminstitute in Copenhagen. I had already seen the work as carried out by Dr. Mörch in Copenhagen and was anxious to see what was being done in London and to obtain their opinion. They take the position that it is a valuable test but were not yet prepared to say that it can adequately replace the standard methods of complement fixation. It has several points to recommend it but will require further study.

So far as equipment and general appearances are concerned, neither St. Thomas' Medical School nor research laboratory are on a par with Denmark, the United States, nor Germany. There can be no question but that they are doing good work.

There are in London two free clinics for the treatment of venereal diseases, in contrast to ten in Copenhagen. One of these clinics is under the direction of Prof. Harrison at St. Thomas' Hospital. It is divided into two parts, one for men and one for women. Patients are received throughout the day and until 6.00 p. m. The treatments are carried out in a large room which is divided into cubicles and passageways so that a number of patients can be treated with the necessary amount of privacy. The patients come from the outside, and the cubicles open to the inside so as to make it easier for the personnel as well as to reduce the number

required. The treatment of syphilis is largely done with silver arsphenamin and mercurial injections. The treatment of gonorrhea is with 1 to 8,000 to 10,000 permanganate injections which are from the first carried back into the bladder. Prof. Harrison reports only 3.7 per cent epididymitis which, considering the fact that many of these patients are working and constantly on their feet, is astonishingly low and would seem to disprove the contention that this form of treatment favors the production of epididymitis. The patients are taught to do this themselves and the irrigator is placed not over 3½ feet above the urethra. The following printed instructions are given out to the patients as required: "Simple Rules of Life" (for syphilis) (for gonorrhea); "Instructions to Patients Suffering from Gonorrhea"; "Instructions to Patients Suffering from Syphilis"; "Warning" after administration of salvarsan or substitute.

Upon entering, the patient is received at the office window, where he is given a number. His urine is examined and, if a new case, he is examined and assigned to a cubicle for treatment. If an old case, his treatment card is sent to the cubicle where the patient goes after the specimen of urine is taken. After treatment the entry is made upon the card which is returned to the admission cubicle or office. It should be stated that each of the treatment cubicles is well equipped with instruments, tables, hot water, etc.

The whole system is described fully in an official publication of the Ministry of Health, entitled, "Memorandum on Organization of Work at Veneral Disease Treatment Centers."

This particular clinic will run about 110,000 treatments yearly and 4,200 new cases.

I noticed that all the operators wear rubber gloves, which I believe is an excellent thing.

From what I saw in England, I am inclined to believe that they are rather breaking away from the association of venereal diseases with diseases of the skin. That still persists in Germany and Denmark.

In Dresden they say that, on account of present economic conditions, it is very difficult to hold venereal patients until they are cured, as all feel the necessity of getting back to work or of looking for a position. With the registered prostitute, here as elsewhere in Germany, it is different. They can be held until they are pronounced cured and during this time are actual prisoners. In this hospital there were eighteen children suffering from gonor-

rhea and syphilis, which was more than in Frankfort. The two cities are of about the same size.

I did not happen to find any place in Europe where they are using intraspinal therapy for syphilis. They seem to be afraid of it.

For some years Germany has officially recognized and authorized prostitution, and I presume that the results obtained are about the same as elsewhere, perhaps a little better than in France and Austria. However, there is a fairly strong organization throughout Germany whose ends are the same as our own social purity organizations. It is known as the "Deutschen Gessellschaft zur Bekämpfung der Geschlechtskrankheiten" ("German Society for fighting venereal diseases").

Some years ago there was a law passed in Denmark prohibiting prostitution, and requiring from physicians a report of all venereal diseases. This report is not made by name but only by initials, giving the sex, age and residence. In case the persons do not take proper treatment, they can be reported to the police after being warned, in which case the law provides for their arrest and compulsory treatment. I understand this is very rarely required. I was quite interested in learning what had been the results of this law and its workings. The physician in charge of a large clinic told me that in his opinion there was as much promiscuous sexual intercourse as ever and probably more, that while the amount of syphilis had decreased as it has in other countries, yet the amount of gonorrhea was slightly higher than before the law was passed. He further stated that the moral conditions in Copenhagen were never worse than at the present time. Other physicians with whom I discussed the subject coincided in this opinion.

Venereal diseases are treated in the Rigs and Commune Hospitals and in ten free dispensaries scattered over the city. In the Rigshospital they use only arsphenamin, bismuth and mercury. In other places they use silver arsphenamin but do not practice intraspinal therapy. They report no special trouble from severe reactions. The Skin and Venereal Clinic at the Rigshospital runs from forty to sixty patients daily.

Good results are reported from the Finsen light in the treatment of neurodermatitis and with the same unconcentrated light in acne. For erythema multiforma they prefer salicylic ointment. In acne necrotica they use zinc oxide ointment with 5 per cent sulphur.

They state that in Denmark there are practically no actinomycosis, no blastomycosis and no leprosy.

In Dresden they claim to have had no severe reactions with

silver arsphenamin but admit a few with neoarsphenamin. It may be stated that at the Station Hospital at Coblenz there were two deaths following the administration of silver arsphenamin. I have not been able to find similar reports elsewhere that I visited, and I am not able to understand it. The German patients are not in as good physical condition, the German technique, to say the least, is no better, and the drug is certainly the same. At the Stadtisches Krankenhaus, Dresden, there had been two deaths from neoarsphenamin in two years, but in both cases the injection was given elsewhere and the patient brought to the hospital afterward.

There had been one case of argyria at this hospital which had resulted from the administration of silver arsphenamin. I did not learn the length of time this patient was under treatment nor how much silver he had received.

With babies, it is the custom to give small silver arsphenamin injections either in the superior longitudinal sinus or in one of the veins of the side of the head.

For salpingitis and epididymitis they give intramuscular injections of from 1 to 2 c.c. of sterile milk, two to three times weekly. The same practice was also followed at the Frauenanstalt at Bendorf. Also for epididymitis, they inject, intramuscularly, from 1 to 5 c.c. of collargol twice weekly.

For the determination of cure they require from 7 to 10 negative smears, five of them to be after a provocative injection of milk. I question if under present economic conditions they hold always to this standard as at several places I was told different things by different people connected with the same institution. At the Bendorf Frauenanstalt, we required five negative smears with two or three following a provocative injection.

At Bonn they have worked out a technique for withdrawing spinal fluid from the rabbit. The animal is held securely, the head strongly flexed and the needle inserted between the atlas and the axis. Not more than 10 drops should be withdrawn from a mature rabbit.

One of the primary objects of my sojourn in Germany was the investigation of the "Interferometrische Methode" as developed by Prof. Hirsch of the University of Jena. Prof. Hirsch is in the Department of Pharmacology and, before coming to Jena, was for several years with Prof. Abderhalden at the University of Halle. It was here, no doubt, that he gained the ideas which induced him to carry on his present work. He is a well-balanced man of unusually high ideals, charming and considerate in his manner

and with a good sense of humor. Except that he speaks no English, he is much like the best type of American. It was therefore with much pleasure that I spent some little time with him both in and out of his laboratory.

In connection with Dr. Löwe, of the Zeiss Fabrique, they have developed an interferometer which is far more delicate than anything previously made. The new appartus will show a concentration variation, through change of refractive index, of as little as 0.005 per cent in the 5 m.m. chamber, which is the one ordinarily used in the most delicate work. The reading is made by adjusting the spectrum of the chamber containing the unknown, to the fixed spectrum of the instrument. The amount of variation, and consequently the amount of adjustment required, is indicated by the fine adjustment screw used for this purpose. The use of the apparatus is based upon the fact that in certain conditions there are developed in the blood, specific lytic ferments (*Abwehrfermente*) which have the power of acting upon the specific pathological tissue with the consequent production of soluble peptone which goes into solution and thus changes the refractive index of the blood serum being examined. The patient's serum without tissue serves as normal.

Up to the present time, the experimental work has been on cancer and ulcer of the stomach, cancer of the liver, pancreas and other organs, tuberculosis, abnormal activity of the thyroid, pituitary, adrenals, etc., and pregnancy. There can be no question as to the possibility of diagnosing pregnancy within the first three weeks and later. It will unquestionably show abnormal endocrine function and serve as a basis of treatment.

The blood serum is collected with aseptic precautions, for if it becomes infected it is useless to go further. A series of aseptic standard nonsoluble extracts has been prepared of gastric carcinoma, gastric ulcer, carcinoma of liver and pancreas, normal placenta, various ductless glands. As stated, they are insoluble and are put up in small tubes containing 0.005 gm. each. The blood serum must be thoroughly freed from blood corpuscles and there can be no hemolysis present. To 0.5 c.c. of this serum there is added the contents of one of the small tubes containing standard organ extract with, of course, the desired control extracts and normal controls. These are kept in the incubator for twenty-two hours and then placed in the chamber, brought to room temperature, and read.

While the method is precise and exact and requires certain precautions, yet it is relatively simple and offers no great diffi-

culties to the trained laboratory worker, provided he has no defect in his color sense, especially for green, which is the most essential. So far as I have been able to determine, this method offers an advance in the diagnosis of some conditions and may be of value in treatment.

Only three instruments have been made. One is being brought to the United States, and I have been informed that Prof. Hirsch is to be in New York in October for the purpose of demonstrating it. The complete apparatus and extracts cost about one thousand dollars.

As stated elsewhere, the so-called "Sigma" reaction as devised by Dreyer and Ward of Oxford is now being studied at the Serum-institute at Copenhagen. It is stated that the technique as laid down must be strictly followed or the results will vary.

This method takes a little longer, but that is not a serious matter. One of the advantages is that, with the varying quantities of cells used in the series of tube titrations, it becomes possible to give a definite mathematical value to the positive reaction so as to better serve as an index to treatment. The plus system as we use it, even with titrations, does not have an absolute fixed value.

Dr. Mörch uses a convenient method of handling definite amounts of complement and antigen which has much to commend it. Within the barrel of an ordinary Record syringe, a collar is attached to the plunger at a point so as to limit the motion of the plunger to a definite amount as 0.2 c.c. or whatever amount may be desired. A coiled spring is placed around the plunger outside the barrel so that it will fill automatically. A small rubber tube is used to connect the syringe with a pipet.

They also use metal Petri dishes for sending out after smears. This scheme seems to be of some value.

In summarizing the German laboratory system, one could best describe the pathologist as a "necroscopist" and, as such, of little immediate value in solving the problems of the living. We have the curious anomaly of a nation which everywhere else exalts the laboratory man but in the field of medicine minimizes his field of activity, his services and his importance not only to himself but to the patient and the physician. The tendency in German hospitals, except for special programs which may be undertaken, is to do little more than urine, blood and sputum examinations, complement fixations and some tissue work. Each department performs its own work, theoretically under the direction of a physician but in actuality more often by a technician. This may have

come about as a result of the German arrangement whereby each chief of section is in absolute command of his own wards and holds himself as final authority on everything. To call in a laboratory consultant would be to admit his fallibility and therefore not to be thought of. As a consequence the average German surgeon does a good operation but does not concern himself so much with finding the cause and insomuch is distinctly inferior to the American surgeon. They do little blood chemistry and renal functional tests and other work of this kind in the hospitals because the technician does not know how and the supervising physician does not have time. The German professor who has attained some distinction has a tendency to take himself rather seriously. I have seen the same thing in the United States, but our big medical men are usually professors as a secondary matter.

LABORATORY SUPPLIES

While in Jena I had the pleasure, through Dr. Löwe, of inspecting the Zeiss Fabrique. I had previously been through the Leitz Fabrique at Wetzlar as well as Bausch and Lomb in Rochester and Spencer Lens Company in Buffalo. As a result of this previous experience, I was perhaps able to learn a little more. At the time of the visit (about May 25, 1923) they had 5,000 employees and were running two shifts. They are probably running nearer their full capacity than any other factory in Germany since they are not dependent upon a supply of coal but secure their power from a water-power electric plant not far from Jena. Then and at the present time, all German factories compelled to depend upon any considerable supply of coal are in an unfortunate position.

They are turning out large numbers of microscopes, and of these a considerable number are of the finer grades. They told me that they are shipping to the United States and to South America and all over the world. They have a reputation as manufacturers of field glasses and are making many of them. They are also making large numbers of lenses for cameras and other purposes, though they make no cameras themselves. The Ica Fabrique in Dresden makes what was originally the Zeiss camera, but the Zeiss Fabrique still makes the lenses.

It may be of interest to know that, no matter how carefully made, no two batches of optical glass are of exactly the same refraction index or, if so, it is an accident. Each batch is kept in a separate bin with the index marked upon the bin. Consequently, for each new batch used it is necessary to calculate and grind

accordingly. The Germans are now using the American briquette method to a greater degree than formerly. Except for the small lenses the glass is prepared and annealed in the form of a small cake which does not require a great amount of grinding to reach the proper shape. I was surprised to see that both Zeiss and Leitz are using the American gang grinding machines. This is the type of grinder which has about twenty concaves to a machine and from six to thirty or more lenses in each concave, depending on the size of the lens. Each machine is run by a single person. Zeiss also uses a considerable number of Brown and Sharp lathes as well as an American automatic machine for making microscope parts. It also struck me that several of their other machines might have been patterned upon this last one. Their telescope department seems to be flourishing. They are also making a considerable variety of scientific and commercial optical instruments. They do not, as Leitz, make moving-picture machines. Of the three German firms—Zeiss, Leitz and Goerz—I think that Zeiss is distinctly in the lead.

There are still many people who believe that there is some sort of mystical virtue in German optical glass and lenses which makes them superior to anything made in the United States. They make quite a number of special instruments which are not made in the United States, and that is because labor is so much cheaper than with us. If one wishes such a special instrument, it may be necessary to purchase it in Germany, but such instruments constitute only a small part of the optical goods output. The ordinary type of microscope made by Spencer Lens Company or Bausch and Lomb is just as good as a similar grade made in Germany, and perhaps better. There is the advantage that the oculars, objectives, substages, darkfields, and mechanical stages of American instruments are all interchangeable. The German field glasses are not superior to those made in the United States; the only advantage is that they are a little cheaper. It is also the same with cameras. It may also be of interest to know that we make better typewriters, automobiles, padlocks, safes and many other articles.

In the Leitz Fabrique, and I presume also with Zeiss, they have the apprentice system under which the beginners go through a sort of a school and work for the first year and frequently two years without pay. Some of the more competent ones are put on the payroll at the end of the first year. In addition to their instruction, they turn out much of the more simple routine work and run

automatic machines. Following this, they receive perhaps one-fourth the wages paid in the United States. For this reason a protective tariff is necessary if we are going to maintain these industries in the United States, and from an experience in purchasing medical and laboratory supplies in the late war, I believe they should be maintained.

The question of aniline dyes and other coal-tar derivatives is also very important to us. During the war we took up their manufacture, and with successful results. It is true that there were several particular dyes with which we had trouble, yet on the whole the results were good. Even the Germans who have used our laboratory stains, which came from the Medical Supply Depot in Coblenz, have been satisfied with the results. The same economic conditions hold as with the optical glass, and in addition they received government subsidies, and as a result they were able to produce them much cheaper. Of course the laboratory use of the aniline products is small as compared with the demands for medical purposes, and that is not to be compared to the amount required for commercial purposes. Recently the French have confiscated the stocks of Meister, Lucius and Brunning at Höchst, the Anilin and Sodafabrique at Darmstadt and the Farbenfabrique von Elberfeld. It is quite possible that they may start to dumping these supplies upon the market, as they are in financial straits and need the money.

Throughout Germany, the accepted anesthetic is ether. In Bonn they sometimes use the combination of alcohol, chloroform and ether.

ECONOMIC CONDITIONS

As a result of the depreciation of the mark, there has been a very great change in the social conditions in Germany. Without going into any past history or attempting any elaborate explanations, I will only try to tell a few things which I observed in April and May, 1923. There are still a few people in Germany who have money but relatively very few. As a result of the fall of the mark, those who were dependent upon investments or had annuities do not know where their next meal is coming from. So many of the factories have had to shut down or only run on part time due to the lack of coal that the laborers are not in good condition. No one dares to save any money, for it is liable to vanish over night. The man who owes money is better off than his creditor.

Medical students come largely from the middle classes, and as

a result, for instance at Frankfort, where there were formerly two hundred German students in a class, there are now only ten to fifteen. The cost of medical books is almost prohibitive. About the middle of May, when a laborer was receiving 12,000 marks a day, an Oppenheim's Neurology cost 70,000 marks and an Operative Surgery, Smedden's, cost about 40,000. As in most cases where the money had been received previously when the marks were of more value, such a price was impossible for a German. At this time it cost a student about 25,000 marks daily to live and 25,000 marks a month for a room. At one time this would have been about $6,000 in our money. At the University of Jena, conditions are not so bad. Quite a few years ago the Zeiss Fabrique passed out of the hands of the Zeiss family to Dr. Abbé. Upon his death it became a "Stift" or endowment concern and since that time has been run by a Board of Directors consisting of representatives of the departments of the concern, professors from the university and a clergyman from Weimar. The profits from the firm go first to building up the factory and for research, aid to the university and to the hospitals and other charitable institutions of Jena and Thuringen. Help is given to a university eating house which is of much help to the students. Even with this, there are a number of students who eat a noon meal only twice weekly and for breakfast have only coffee and rolls. Heidelberg has just received an endowment of 25,000 English pounds which will be of material help. College professors and physicians who were at one time fairly well paid are all poverty stricken, and many of them do not have enough to eat. They are, for the most part, not as well off as the day laborer, and his condition is deplorable.

On May 8, 1923, when the mark stood at 21,000 to the dollar, the following prices were average for the city of Frankfort:

	Marks
Suit of clothes	1,100,000
Shoes	150,000
Butter, per pound	10,000
Oleo, per pound	5,000
Meat, per pound	4,000
Loaf of bread	1,500
Pay of day laborer	12,000

On July 14 a lunch for two cost 860,000 marks.

The German hospitals are financially in a bad way. Many of them had endowments which at one time were sufficient to support them without having to stint in any way. For instance, the Evan-

gelische Krankenhaus of Coblenz was at one time a very rich institution, but now they have nothing and there is no one to help them. Today, for every million dollars they once had in securities, they would have about one dollar. They are all short of textiles such as bed sheets, blankets, pillow cases, etc. They use no absorbent cotton but depend entirely upon wood cotton, which they use, then wash and resterilize and use again so long as it is mechanically possible to do so. They are not able to purchase surgical gauze or bandages but use paper bandages and the wood cotton, which latter our surgeons would not use during the war. Alkaloids are almost prohibitive in price. There is almost no santonin in Germany. In many hospitals there are patients who are not able to have morphine when required, as it is too expensive. On May 1 a single injection cost 1,800 marks or what would have once been $450. As a result there has been an attempt to secure cheaper substitutes for the standard drugs and a considerable change in the type of prescriptions written by the physicians. Quinine is very scarce and expensive, but fortunately there is not much malaria in Germany at the present time. I have been informed that, in the Rhineland, large numbers of the Moroccan and negro soldiers of the French Army, of whom there are thousands, are malaria carriers and there are also anopheles mosquitoes. So it would appear to be only a question of a few months, unless conditions change, until malaria will be added to their other troubles.

In the laboratories they are not able to purchase the necessary amount of alcohol and other reagents and as a consequence, research work which has played so important a part in the German medical world, is almost brought to a standstill. Prof. Koch has stopped work in his pathological museum because he cannot afford to buy glycerine for Kaiserling's solution.

Germany has had for some years the Krankenkasse system or scheme of sick, accident and old age insurance. Without going into details, all laborers are compelled to belong and pay a certain sum each month. They belong to the third class and were supposed to be entitled to treatment by the Krankenkasse physician or entrance to a hospital in case of illness or injury. Unfortunately, now, the sum which the Krankenkasse is able to pay is not sufficient and the physician would not get enough to pay street-car fare, and obviously it is not enough for food and medical supplies in the hospital. Consequently the poor laborer is the loser as he paid his money when it was good money, and now, is he tries to

collect, it is impossible. Any money he might have saved has evaporated and he cannot work and be sick in the hospital at the same time. So medical and surgical work is almost at a standstill.

There is also a noticeable increase in the amount of prostitution. The police in Frankfort told me that the question of handling the young girls is becoming a serious matter to them, and never in the history of the country was it so serious. I presume there is a certain amount of transition taking place from the time where a young girl secured a new dress when the old one was worn out to something away in the direction of our custom. In any event, they do not have enough to eat and wear and, as always under such conditions, prostitution increases. Along with this there is an increase in the amount of venereal diseases. Among the lower classes there is a certain amount of laxity to the extent that an engagement is sometimes considered to bestow upon the parties certain of the privileges of matrimony, but it is not commonly manifested as street walking and prostitution. Among the better classes I have no reason to believe that the standards of morality are any lower than our own.

I have been impressed with the fact that the German university professors and others do not work as hard as we do. They start about 8.00 or 9.00 a. m. and remain until 12.30 or 1.00 p. m. They then go home for lunch, and in former times a heavy meal, and generally take a nap and return about 3.00 or 4.00 p. m. and work until about 6.00 p. m. They all seem to move leisurely but they gain time by having no diversion during the day or while they are actually at work.

I was informed by an American surgeon who has been in most of the good German clinics that they are doing better work than we in lung, heart and stomach surgery. We are ahead of them in every other way, and most of all in the surgery of the head and brain.

IS CHEMICAL WARFARE MORE INHUMAN THAN GUNFIRE?

By Lieut. Colonel ALBERT P. FRANCINE
Medical Officers Reserve Corps, United States Army

THERE are appearing from time to time articles or editorials in the press against the use of poison gas in warfare, based on the assumption that this is more deadly and inhuman than other methods. While not wishing to go on record as defending any branch of warfare, directed as they all are to the killing or maiming of human beings, yet this point of view calls for comment.

1. Because it reflects admirably the opinion of the vast majority of people, who visualize large groups of men struggling in torment, gasping and choking, and dying in acute agony. This is a very incorrect picture and therefore unfair and dangerous, as all untruth is unfair and dangerous.

2. Because it is based on an erroneous, though natural conception, but failure to recognize the essential features, of chemical warfare as it developed and existed in the last summer of the war when it was most effectively and vigorously pushed.

3. Because it fosters a propaganda of unpreparedness, in an inevitable branch of offensive and defensive warfare of the future, and is therefore un-American and unwittingly unpatriotic.

I can speak the more convincingly perhaps because I am not a professional soldier nor professional propagandist of any kind, except for better health and welfare, and speak from first-hand practical experience in the hospital and in the field. As Consultant in Gas to the IV U. S. Army Corps from July, 1918, till after the armistice, six weeks of which was spent as Resident Physician-in-Chief to the great gas hospital at Toul, I had every opportunity to see and learn, and must have been wanting in observation and understanding if I did not see and learn.

Let me, at the outset, invite special attention to official figures of the Report of the Surgeon General for 1920. They say figures can be made to tell any story, but it is hard to get but one story from the official fact that of the total battle casualties from all causes during the war among U. S. troops, more than one-quarter were due to gas alone; and that of these, less than 2 per cent died; while of those injured by gunfire, high explosives and similar methods, more than 24 per cent died! Thus gas was twelve times a better risk

than bullets and high explosives. More striking still, these latter were responsible for twenty-five times as many blinded as gas. Out of over 70,000 gas casualties, there were just twenty-nine men blinded in one or both eyes!

One cannot estimate suffering in terms of percentages, and anyone's conclusions, though earnestly arrived at, may be wrong. The public formed its opinion on gas, once and for all, in the shock of those early accounts of the chlorine cloud-gas attacks on the British on the western front, and the Russians on the eastern front, on troops surprised and defenseless. These vivid pictures were made before gas defense had been developed, and were indeed cruel, ghastly and inhuman.

This use of gas was indefensible on the score of honor, because Germany was a signatory twice to The Hague Convention outlawing the use of poison gas in warfare; on the score of humanity, because of the frightful trail of suffering and death. It was, from the German point of view, a most successful strategic military surprise. Had the Germans been able at the time of Ypres to use gas in the amounts, manner, and kind developed by the spring of 1918, they would have quickly won the war. No human power, nothing could have stopped them.

But under the urge of self-preservation or annihilation, defense was quickly organized against this deadly weapon. The gas mask, at first a flimsy thing, sprang into being, soon to be perfected; and gas discipline was established for all troops. Germany had long been prepared to strike with gas, and she had struck a terrible, surprising blow, but it had fallen short. The so-called asphyxiant gases, like chlorine and phosgene, acting through the respiratory tract, soon lost much of their efficiency as battle gases due to gas defense. All forms of gas which have to be inspired unfiltered for their effects are innocuous against the gas mask.

It should be noted that the different gases attack primarily certain functions or systems of the body; thus the central nervous and circulatory systems, like phosgene; the respiratory system, like chlorine; the eyes, tear gas; the nose and pharynx, sneezing gas. There we have a very pertinent feature of the development of the science of chemical warfare and the effort at protection against it. This should not be lost sight of in thinking of possible gases of the future; they must permeate the mask as at present or in the future constituted, or they must act on some unprotected surface of the body. It is well not to let our imagination run wild in weird tales

or dreams of gases that will kill or maim armies by the wholesale. The answer is gas defense. In reference to unprotected civil populations it is absolutely essential that chemical warfare should not be used against cities or towns, since with gas, as it already exists, these could be wiped out over night.

Meanwhile, cloud effects depending on the strength and direction of the wind, as for instance the liberation of gas from batteries of the Livens projector camouflaged in No Man's Land, became too uncertain and too inefficient against the improvement in the mask. The Germans made the next great step forward in using gas in shell. Thus any given area or terrain could be reached with accuracy and with any combination of gases.

The only unprotected surface of the human body remained the skin. The Germans next called upon their research chemists to discover, and their great dye and chemical works to produce in quantity, a gas that would strike man where he was unprotected, and there appeared the greatest of all battle gases, mustard gas, or yellow cross—not nearly as deadly as phosgene or chlorine, but many times more effective in producing casualties. Phosgene and chlorine are only effective in such high concentration, hence, in such restricted area and are disseminated in the air so quickly as not to be compared to mustard against protected troops. It must be clear to everyone that you could not chloroform or etherize a man in the open unless you held him down and shut out the air. The same applies largely to all gases, even the deadly and instantaneous carbon monoxide, a good whiff or two of which will kill. But you have to reckon with the dissemination by the air, and it cannot be used as a battle gas. Further, it is plain that strategically it is vastly more important to put 2,000 men permanently out of the lines than to kill 15 or 20 men outright. This is exactly what mustard did. To understand chemical warfare at the peak of its efficiency, one must understand mustard gas and its effects.

It is not what the public would consider a gas at all, as it is a heavy oil thrown in shell. Great extent of terrain can thus be contaminated for long periods of time, as long as ten days or two weeks, particularly in damp, wet, low-lying fields or woods. It volatilizes with difficulty and only under warm sunshine, when it is detectable by odor. Troops going into such areas or bivouacking there are burned, that is, gassed. It is usually not inhaled at all, or very slightly. The action is escharotic like ivy poisoning, if you will, and burns take some time to appear, often twenty-four hours. Super-

ficial burns heal in a few days; deep-seated burns take a long time but are not very painful. It is simply an acid burn. So that all but the most severe cases who have inhaled the gas, recover in due course, with no permanent damage done. It leaves few, if any, pathological after-effects. It does not even give rise to activity in old, healed tuberculous lesions, as some have thought.

So when I think of the hundreds of men littered in the great gas hospital every night or so, and the overflow had to be cared for in adjacent hospitals, I do not picture men who were coughing, choking or gasping for breath, for they were not; but of men cold and exhausted from exposure and want of sleep, quiet, or occasionally laughing, fellows burned more or less seriously about the eyes and body. Casualties all right, but not suffering like torn men, and not to be permanently disabled or even scarred. Approximately 90 per cent of the cases in the hospital were suffering from mustard gas, and 80 per cent of these were not seriously gassed. In only 20 per cent was the condition severe enough to confine the men to bed for more than forty-eight hours. The death rate in the hospital was 1.98 per cent, and all deaths were from mustard gas. This percentage again goes to show that the mortality and effects of gas, where gas defense had become well-developed, have been, as was to be expected, greatly exaggerated in the minds of laymen, doctors, and soldiers themselves, who did not study it closely, and among large groups.

Casualties from gas have a direct relation to the gas discipline in an organization. This should be clearly and definitely understood. It was not at all exceptional in two companies, side by side, exposed to the same straffing with gas, to find three-quarters of the men in one company gassed, and not a single case in the other company. In one instance a battery commander kept his men in respirators for eight hours without a casualty, while a neighboring battery, careless in wearing the mask, or taking it off too soon, were all gassed. Gas discipline had to be continually and strictly kept up. The men often do not like to wear the mask, grew careless about adjusting it properly, or took if off too soon, careless even of gas itself. The Germans encouraged this neglect by repeated abortive attacks with non-toxic gases. An organization which had been in a position a good while would be shelled with tear or sneezing gas, with intentional ineffectiveness. Then suddenly they would be drenched with the real thing. Or the men of a new organization, relieving an old one, would sometimes be told by their comrades

not to worry about gas. They made light of it. With the idea of taking advantage of developing carelessness, for the Germans knew the moment a change in the line was effected, the enemy would follow the above tactics, lightly shelling outlying areas, kid them along, so to speak, and then suddenly let them have it—result, hundreds of casualties.

In all villages back of the lines, jammed with troops in support, and at all cross-roads, Claxton automobile horns were set up. They were sounded at the beginning of a gas attack, and every one was under orders to quickly adjust his mask, carried always (at the front) on the chest in the so-called alert position. Men did not always do it if not under the eye of their officers, and there would be scattered casualties.

Brig. Gen. Amos A. Fries, Chief of the Chemical Warfare Service, has dealt with this subject in a masterly and interesting way, as has Col. H. L. Gilchrist and Col. James Robb Church and others. I mention them because professional soldiers are accused of a partisan view about gas. But they know and their opinions should be listened to.

CONCLUSIONS

1. The terrible impression people have of gas arises from its early, tragic, inhuman and indefensible use against troops, surprised and defenseless before this untried but potent offensive weapon.

2. People generally, including even soldiers, have a much distorted mental picture of its effects, and begin by thinking of it as of the nature of deadly fumes. This is only true within limitations. The effects of gassing are, in the majority of cases, superficial eye and body burns. Gas of any kind seldom kills outright in the field. It temporarily disables.

3. Mustard gas is the most effective of all battle gases in being the greatest casualty producer, and hence was by far the most widely used. It is not usually inhaled. It is a burn.

4. The percentage of deaths from gas and of permanent disability (blindness) was both absolute and relatively extremely low.

5. Chemical warfare put more men out of action with less hurt to the individual than any other branch of the service.

6. Following the perfection of methods of defense against it, it became many times less inhuman than shot and shell.

7. Anyone who saw closely the use and effect of gas would far

rather be exposed to a gas attack than take a chance with a half-inch of red-hot flying steel.

8. It put over 70,000 of our men out of the war with usually slight and temporary injuries who otherwise would have continued to be exposed to the damaging effects, severity, and cruelty of gun fire. To this extent gas may be looked upon as having protected this particular group.

9. So far as mere savagery and brutality goes, gas is a refinement in warfare. It is, in this relation, as much an advance over gunpowder as the latter was over the broadsword, battleaxe and pike.

10. It would appear incapable of leaving pathological after-effects. This view is endorsed by American, French, British and other authorities.

11. Under no circumstances let us delude ourselves with the vain hope that chemical warfare will not be an important factor in future wars. The pact, or agreement of any men or group of men or nations, cannot and will not stop it. This is a propaganda of unpreparedness.

12. Let attacks on civil populations of cities and towns be outlawed, if possible, that civilization may endure. This may appeal to the self-preservation even of barbarians. Fear of retaliation is a convincing factor in war. Retaliation is a necessary evil.

13. All things considered, the intensive study and research in chemical warfare seem to have well fixed its possibilities, unless what appear chemical and physical impossibilities are to be overcome. However, let us not hesitate to admit ignorance and suspend judgment.

14. A nation with a flourishing dye industry has at hand a weapon that can be turned instantly to warfare purposes. One cannot demobilize that. Let the United States foster this that it may be prepared, and certainly not allow a monopoly in the hands of any other country.

15. I yield to no one in my intensity of feeling against war. But that chemical warfare as it developed both in effectiveness and use was more inhuman than other methods of warfare, will not be admitted by anyone who knows.

THE INFLUENCE OF THE ENDOCRINES ON GROWTH AND DEVELOPMENT[1]

By Captain WILLIAM C. PORTER
Medical Corps, United States Army

IT IS becoming better and better recognized that what we are as individuals is not the result of blind chance or fortuitous circumstance but that what we are or hope to be as regards stature, physiognomy, temperament and capabilities is the result of millions of years of ancestors who have transmitted to us in the germ plasm certain constitutional tendencies and limitations, not the least of which is the organization of the nervous system together with its coadjutant, the system of endocrine glands. By endocrines we understand those bodily glands which possess no duct and which manufacture a secretion or harmone which is poured directly into the blood stream or lymphatic channels and thus influence other parts of the body. These harmones are in the nature of enzymes, and their action upon other structures is a biochemical one. Strictly speaking, those structures which exert their influence by way of nerve pathways are not endocrines. Thus Sajous insists that the influence of the pituitary gland is exerted, not by means of any internal secretion, but does so by nerve influences passed along tracts to the sympathetic ganglia in the trunk. Others are at variance with this view.

We are at present in a stage of mutability of ideas in regard to the functions and therapeutic value of the endocrines. There is overenthusiasm at one extreme and overscepticism at the other. One group of workers feel that they are unable to accept any proof of the action of a given gland unless its harmone has been definitely isolated and a complete laboratory demonstration made. Another group has apparently lacked discrimination and has accepted statements of an unscientific nature and has drawn unwarranted conclusions as to the functions of the endocrine glands and therapeutic value of their products. Doubtless, between these two extremes lies a comparatively wide field of usefulness for this class of products. There can be no doubt that the clinician has demonstrated the efficacy of certain forms of endocrine therapy and that clinicians have proposed hypotheses in explanation of certain physiological processes based upon an endocrinological foundation that

[1]Essentially as read before Orthodontia Study Club, Kansas City, Mo., February 15, 1923.

have been later demonstrated by the laboratory workers. In any event, so many vital processes are so nicely explained by the endocrine action and interaction that one is tempted to accept such explanation until disproven.

The present presentation does not pretend to bring forward any new facts or theories. It is simply a collation of some of the information available to the interested clinical worker which has proven helpful in the diagnosing of otherwise obscure conditions and in explaining their mechanisms. For our present purpose the endocrine chain may be said to include the following structures: Thyroid, parathyroids, adrenals, pituitary, pineal, islets of Langerhans of the pancreas, certain cells of the liver, luteal bodies of the ovary, interstitial glands of the testicle, thymus, mammary glands and probably certain parts of the spleen. It must be appreciated that no one gland acts alone to effect a given result. As will appear later, each gland has a synergistic or stimulating as well as a counteracting or inhibiting effect upon one or more of the other glands. The whole chain is under the influence of, and acts upon the vegetative nervous system, either through its sympathetic or its autonomic fibers. Like the latter the endocrines are a portion of the archaic nervous system whose principal duty is that of defense and reproduction.

Therefore a brief consideration of the vegetative nervous system is necessary to a correct conception of the endocrine chain. This portion of the nervous system is the oldest, both phylogenetically and ontogenetically. It is the nervous mechanism which has to do with those two primitive instincts, self-defense and propagation. It consists of two divisions, the sympathetic and the autonomic. The first originates from presomatic cells, which contain adrenalin. It comprises a system of ganglia and fibers derived from the spinal cord segments from the first thoracic to the fourth lumbar level, the ganglia lying along the vertebral column and the fibers and plexuses being distributed widely to the viscera and surfaces of the body. It is through this system that the body defenses are organized against external foe or internal bacterial invasion. Its impulses control the mobilization of blood sugar as a fuel for the energy needed, increase heat in fever through the adrenals and probably thyroid, check peristalsis, check secretions of the alimentary tract, check sweat glands, dilate pupils and stimulate respiratory rate. Sympatheticotonia, the condition of overaction of the sympathetics, is a fairly distinct clinical syndrome and may be

produced experimentally by the administration of adrenalin. Stimulation of this system increases action of the adrenals, thyroid and pituitary (6). No direct inhibitor among the drugs is known. Pilocarpin antagonizes the sympathetic by stimulating the autonomic (21).

The autonomic system, the second great division of the vegetative nervous system, has its origin in the medulla of the hind-brain and its fibers run principally in the vagus or tenth cranial nerve, but also in the third, seventh, ninth and eleventh cranial nerves, entering into the various vegetative plexuses of the head, chest and abdomen. The sacral autonomic fibers come from the first three sacral segments of the cord, run in the pelvic nerve, form the hypogastric plexus, and are distributed in general to the organs of the pelvis. When the wide distribution of the vagus is remembered it is not surprising that an overacting autonomic produces a wide range of symptoms, which syndrome is known as vagotonia. A typical vagotonia shows contracted pupils, Stelwig's sign, Von Graef's sign, tendency to lacrymation, hot flushing, salivation, excessive perspiration, slowed heart beat with paroxysmal tachycardia, low blood pressure, tendency to attacks of bronchial asthma, eosinophilia and lymphocytosis, globus hystericus, gastric pains and hyperchlorhydria, pylorospasm or cardiospasm, mucous colitis, spasm of neck of bladder, tendency to penile erections and increased peristalsis. Of course, any of the above symptoms may be absent or slight. Pilcocarpin and eserin are stimulants to the autonomic and increased susceptibility to these drugs in small doses is used as a diagnostic measure (21). Atropin counteracts vagotonia. The differentiation of sympatheticotonia and vagotonia is not always well marked. Paradoxical as it may seem, both conditions may be present in a given case.

That there is a close physiological relationship as well as an embryological one between the vegetative nervous system and the endocrine chain is attested by the similarity of symptoms presented in a case of disharmoniously acting endocrines. Whether it is the action of the nervous system upon the endocrines or the effect of the endocrines upon the nervous system or whether there is in action a vicious circle of influences is not always clear. Probably it is the last that actually occurs as an end result.

In considering the endocrine chain it may be well to regard their life history as occurring in three epochs: The first, the period of growth and development, in which the thymus and pineal

are of greatest importance; second, the period of aggressive activity in which the thyroid, parathyroid, pituitary, gonads and adrenals are paramount; third, the period of atrophy during which all the endocrines lose their activity. In the following discussion of their functions, it should be remembered that where one gland is reciprocal with another, deficiency in one may be overcome by the overaction and compensating action of the reciprocal gland. This point is of especial importance in therapy.

Thyroid.—This gland is embryologically derived from cells in the median floor of the pharynx, these cells wandering downward with the heart in development of the body and forming branching tubules. In the lower animals these tubules open into the pharynx by way of the thyro-glossal duct. In man the tubules become closed vesicles and the duct obliterated, but accessory thyroids are often found along the course of the duct. The probable functions of this gland are: stimulation of the autonomic nervous system and of general metabolism, especially as regards nitrogen, phosphorus, and probably calcium; stimulation of regeneration of tissues, growth of hair, development of cortical cells in cerebrum (deficiency noted in cretins), growth of skelton (probably through close relationship with pituitary), manufacture of red blood cells; increase of dextrose content of blood (29), and intake of oxygen and output of carbon dioxid (probably through adrenals). It raises blood pressure, stimulates heart beat and sweat glands, increases fat consumption, maintains iodine concentration and has a stimulating effect upon gonads and bears a reciprocal relationship to them (frequent enlargement of thyroid at puberty, during menstration, in pregnancy and at menapause). Thyroidectomy is followed by atrophy of uterus. A deficiency of thyroid in early youth prevents development of sex glands and castration after thyroidectomy favorably influences metabolic crises (7). It reciprocates with pituitary. Following thyroidectomy colloid masses appear in anterior pituitary assuming straining qualities identical with those of thyroid and all secretions of pituitary are increased. The close embryological relationship between these two glands should be remembered (6).

The thyroid speeds up function of the higher psychic centers and renders the subject of hyperthyroidism more irritable (probably through stimulating phosphorus metabolism and elimination of phosphoric acid). In the amphibia metamorphosis does not take place in absence of thyroid harmone, the liver, intestine, thymus,

brain, kidney and spleen retaining their larval characteristics. The thyroid inhibits the action of the adrenal cortex, pancreas and spleen (iron storage only). It regulates body heat probably independently of any heat center in the hind-brain. Delayed dentition is frequently due to thyroid deficiency, and it has been observed that feeding of thyroid often speeds up dentition (28). Thyroidectomy has caused prolonged retention of deciduous teeth in humans and retardation of regeneration of teeth of rabbits (Krantz). Alexin is increased by injection of thyroid in dogs and rabbits. The essential thyroid harmone has been isolated by Kendall and is termed thyroxin. This is an iodin compound of indol which is a decomposition product of trytophan, a constituent of the proteil molecule. The indol nucleus does not appear to be manufactured in the body but is split off from the proteid molecule by the action of intestinal flora, particularly the *B. coli.* There is a form of infantilism due to persistence of the intestinal flora of the nursing period. The iodine side chains in the thyroxin molecule are not essential to the control of the metabolic rate but do appear to be essential to the developmental influence of the thyroid.

New growths of the thyroid may be associated with no alteration of endocrine function. In case of increased gland structure, hyperfunction usually results. Where the increase is in interstitial structure or in growth of foreign cells, as in sarcoma or carcinoma, there is hypofunction. Acute inflammation of the gland may accompany or follow influenza, typhoid, scarlet fever, or rheumatic fever and are usually manifested by hyperfunction followed by hypofunction. Prolonged exposure to sunlight stimulates the thyroid, probably thus explaining the rarity of myxedema in the tropics.

Basedow's disease or exopthalmic goiter is a chronic disease showing effects of increased activity of the thyroid. It is of little interest in the present discussion, except as showing the effects of a hyperacting thyroid together with the effects upon other endocrine structures and upon the vegetative nervous system.

The term *hyperthyroidism* is used to designate a condition milder in degree than the foregoing but with the same mechanism at work. It usually occurs in a person of the so-called hyperthyroid make-up. Investigation of the family history shows a tendency for the individual to resemble one or another of the parents who were also hyperthyroid. Women far outnumber men, and the subject is usually emotional, with highly neurotic tendencies, nervousness being increased by approach of menstrual period.

The patient, if a woman, is usually well developed, of good figure, fine skin and complexion, active sexually, with well-developed breasts and tendency to have teeth crowded.

The so-called hypothyroid, i.e., thyroid minus, individual is one displaying tendency to lateral position of eyebrows, dry skin, tendency to falling out of hair with premature graying, chilliness of skin, poor complexion, bleeding and receding gums, head usually round, small nose, small eyes, coarse lips, delayed eruption of both milk and permanent teeth, imperfect enamel and cusp development, with irregularity of position, hypertrophied tonsils and adenoids, small nails, normal arching of nails absent, tendency to swelling of dorsum of hands and feet, complaint of so-called rheumatic pains in morning and anemia. Children of this type are usually backward in school, are disinclined to play, fatigue easily and show marked susceptibility to infections. Temperature is usually subnormal, constipation is the rule, nocturnal diuresis may be present and the appearance of secondary sexual characteristics is delayed. In women there is ammenorrhea, metorrhagia and maybe sterility. There is lack of sexual libido and maybe impotence.

Cretinism, the classical example of absent thyroid harmone, may occur sporadically as the result of infectious disease, or congenitally. Heredity plays an important rôle. Endemic cretinism is common in goiterous districts. Fifty per cent of cretins are goiterous. The disease is characterized by arrested or retarded development of bone, the earlier the thyroid change the more marked being the bone alterations. The cretin shows the following characteristics: forehead is low, root of nose is broad and deep, malars are prominent, prognathism, spheno-occipital fissure open late, extremities and ribs are short and thick and sometimes deformed, and pelvis is narrow. Symptoms rarely manifest themselves before the second year of life, the infant at birth being of normal size. The developed cretin is of low stature, has small eyes, widely separated, giving the face a stolid expression, and has muddy, wrinkled and thick skin and short thorax. There is absence of breast development, thickened mucosa of mouth and pharynx, large thickened tongue, scanty or absent perspiration, thin and coarse hair, brittle nails, carious teeth, undeveloped genitalia, subnormal temperature, and mental development is that of idiocy or low-grade imbecility. They are the so-called beast-men or plant-men.

Myxedema is a chronic disease of middle life due to loss of thyroid function either as the result of pathological change or of

surgical extirpation. Women are affected seven times more frequently than men. Multipara are especially predisposed. The disease is rare in the tropics. The symptoms are of slow onset. There is increased fatigability, loss of memory, listlessness, slow speech, leathery voice, thickening of skin, first noticed on the face, eyelids and chin. This skin change is characterized by absence of pitting and by a sallow or yellowish color with areas of more deeply staining pigment. It is rough and scaly, with absence of perspiration. The cheeks are flabby and the lips are thick, the lower one often being averted. The tongue is apt to be large and clumsy, and mucosa of the cheek and palate are often stiff and swollen and show yellowish pigment. The teeth are often carious and the hair coarse and brittle; the hands spade-like. Other signs are frontal band alopecia, tendency to lacrymation, slow and weak heart action, pendulous abdomen. Menstruation is usually irregular with metorrhagia, but the whole condition improves during pregnancy.

Parathyroids.—These glands are embryologically of entodermal origin, having common origin with thymus from branchial clefts in close association with thyroid. Their function appears to be that of a regulator of calcium metabolism and a stimulator of renal epithelium. They inhibit conductivity of nerve cells through inhibition of phosphorus metabolism. Parathyroidectomy produces tetany, which is a condition characterized by paresthesias and numbness of skin, overexcitability to nerve impulses, defective development of enamel due to calcium deficiency, developmental changes in nails, hair and bones, Trousseau's sign, Chvoslek's sign and twitching of muscles. In cases of recurring attacks of tetany the results are visible in the teeth, especially in the canines and incisors which show horizontal furrows of nondevelopment of enamel, the formation of these furrows being synchronous with the attacks of tetany, during which no calcium is available (Fleishmann 28). Parathyroidectomy in rats causes circumscribed defects in the enamel of incisors with frequent fracture at point of defect (28). The exact mechanism of the pathology of tetany has not been worked out. Normally, creatin is an important product of muscle tonus. This substance is comparatively inocuous to the body and is changed to creatinin by the loss of one water molecule and is excreted as such in the urine. Methyl-guanidin is chemically creatin minus an acetyl radical and is highly toxic. Parathyroid probably forms a detoxicating substance which most likely

is a calcium compound. At any rate, the administration of calcium often relieves tetany. During pregnancy the foetus acts as a calcium parasite and uses up the store of available calcium in the body. The tendency to caries of pregnant women is notorious, as is their craving for earthy substances. Osteomalacia or softening of bones due to demineralization with onset at pregnancy or during the puerperium has long been recognized. Rabbits fed on parathyroid, anterior pituitary and adrenal grew longer incisors than controls (28).

Pituitary.—This structure consists of three portions, each apparently with functions of its own. The anterior lobe consists of follicles containing eosinophilic granules and chief cells, the former being more numerous during middle life. It is derived from Rathke's pouch of the pharyngeal endoderm. The posterior lobe consists principally of pigmented cells of various sizes and shapes and is derived from the midbrain ectoderm. The pars intermedia consists of colloid collected in tubules and vesicles, whose function is still controversial.

The anterior pituitary is believed to stimulate epiphiseal growth of bones, to stimulate sugar metabolism and is in important relation to pancreas for after removal of the latter, eosinophils disappear from the pituitary. Hens lay more eggs when fed on anterior pituitary, and it is believed to stimulate ovulation in women and to initiate menstruation. The testicle is affected by stimulation in growth and activity of Leydig's cells. The anterior pituitary acts as an inhibitor of the adrenals, partial destruction leading to a hyperplasia of the latter (13). It plays an important rôle in phosphorus metabolism and inhibits calcium utilization, an increase of calcium salts in the blood being observed after its administration. Its chief cells hyperplase following thyroidectomy and in cretins.

The posterior lobe stimulates activity of renal epithelium, plays a part in the formation of cerebrospinal fluid, raises blood pressure, stimulates milk production, contracts unstriped muscle fiber and stimulates metabolism in tissue cells (23). It inhibits Leydig's cells, and sugar assimilation and maybe skeletal growth. Its relation to the gonads is noted in pregnancy, at which time it increases in size. The posterior lobe is believed to stimulate excretion of calcium while the anterior lobe decreases the same (28).

Types of individuals predisposed to malfunction of the pituitary have been described by various writers. The hyperpituitary type

of Lanois, in which the characteristic changes antedate the ossification of the epiphyses, and the postadolescent type of Marie show similar symptoms. They have widely-spaced eyes, broad glabella, wide level brows, tendency to stub nose with concavity of bridge, large chin, broad shoulders, coarse features and deep voices. There is tendency to pituitary headaches, which are brought on by emotional stress or sexual activity or by ingestion of sugars and are worse before menstruation and are absent during pregnancy. The preadolescent type usually shows enlarged incisors, with considerable separation. The postadolescent type shows almost invariably a separation of upper and lower incisors. Both may show malocclusion due to overriding upper maxilla or some prognathism of mandible. Choasma frequent at angles of mouth or at hair line (27).

The classical picture of chronic and marked hyperfunction of the anterior pituitary is presented in acromegaly. This disease is most frequent in the third decade of life and usually occurs in large persons. All bones are more or less affected by exaggeration of bony prominences. This is marked in the skull. The glenoid processes are larger and more widely separated, mandible is enlarged in all directions, sinuses are all enlarged, face is coarse featured, nose large, upper lip long and thick, ears increased in size and maybe shapeless, teeth are separated, with malocclusion, tongue enlarged and indented with elongated papilla, soft palate and uvula thickened, hands and feet increased in size, external genitalia enlarged but internal genitalia atrophied. The thyroid becomes goiterous and finally atrophied. The head sinks forward until chin may rest on sternum. Hands become paw-like and fingers sausage shaped. Complaint of frequent severe headache and quite often epileptic seizures. Skin is of yellowish or brownish color and excessive perspiration is present. The patient tires easily, mental processes are sluggish, and there is dyspnea on slight exertion. Various internal organs hypertrophy, and there is excess of calcium and magnesium in the blood and retention of phosphorus in the bones. Only if the disease is present before junction of the epiphyses is there any great increase in length of bones.

To summarize: Preadolescent hyperpituitarism is characterized by giantism and postadolescent hyperpituitarism by acromegaly.

In hypofunction of the anterior pituitary, the characteristic bodily type is that of infantilism if onset is prior to adolescence, while the postadolescent type shows utero-ovarian disorders.

In hyperfunction of the posterior lobe one may expect tendency

to glycosuria, diminished carbohydrate tolerance and increased basal metabolic rate.

In preadolescent hypofunction of both lobes the individual tends to conform to the type of Frohlich's adiposogenital dystrophy. Cushing has described a postadolescent type with similar symptoms. The person is stout, with more or less feminine anatomical characteristics such as wide hips, limited distribution of pubic hair, developed mammary fat, small genitalia and lowered gonadal activity in the male and lowered sexual activity and one child sterility in the female. The thyroid and thymus enlarge while the adrenal cortex and the sex glands fail to develop. There may or may not be polyuria. In adults clamping of the stalk of the pituitary results in intense atrophy of uterus and ovaries (6). Sajous holds that there is no internal secretion of the pituitary and that identical results as appear in hypopituitarism are produced by pressure on the tuber cinerium and that the influence of the pituitary is exerted nervously on the splanchnic ganglia of the sympathetic system which controls the thyroid, adrenals, and thymus and coordinates them (10, 11). Paradoxical as it may seem, in hypopituitarism the upper incisors are frequently enlarged, especially if there is arrested development of the genitalia (27). Ascoli and Legmani noted retarded dentition in puppies by removing pituitary and another observer noted that after the same operation the milk teeth of dogs were retained permanently (28).

Adrenals.—Embryologically, before the neural folds have united to form the future spinal cord, a wandering of neuroblastic cells takes place. They arrange themselves on either side of the structure that is to become the future spinal cord. These masses become the sympathetic ganglia. Some of the cells, however, do not become nerve elements but retain their cellular characteristics, develop an affinity for chromic acid and its salts and are found in abundance in the adrenal medulla. Some become deposited in the walls of the blood vessels and some in the skin. Chromophilic cells wherever located yield adrenalin and are closely associated with the sympathetic system. Adrenalin is chemically an amino acid derivative and is closely related to tyrosin, which in turn is the precursor of all melanins. This explains the pigmented areas of skin observed in adrenotrops. Other biologic agents which have the power of influencing smooth muscle are likewise derived from the amino acids. The conversion is brought about by the action of certain intestinal flora, thus explaining the high blood pressure and arterio-

sclerosis so often seen as a result of intestinal stasis. The chemical similarity between tyrosin, albumen and adrenalin should be noted in this connection. Anatomically, the adrenals are highly innervated, thirty-three nerve trunks entering the right gland alone. These nerve trunks pass between the cylinders of the cortex and ramify in the medulla. The same blood circulates through both the cortex and the medulla. Adrenalin is manufactured in the medulla only. Its principal effect is its pressor action on smooth muscle of blood vessel walls. It also exerts a stimulating effect upon formation of bone barrow, upon the thymus and spleen and upon the release of glycogen from the liver, thus producing hyperglycemia and glycosuria. In addition, it has the power of converting glycogen into glucose and enters the red blood cells in the form of oxidase and in that form oxidizes the cellular elements throughout the body. By its sensitization of sympathetic terminals it increases somatic response to emotional stimuli. It likewise increases elimination of urea and inhibits peristalsis of the gastrointestinal tract and lacrymal, salivary and gastric secretions, at the same time stimulating the sphincters of pylorus, ileocaecal valve and internal anus (6). It is not destroyed by acid or by digestion. Its administration cannot sustain life after extirpation of the adrenals.

The adrenal cortex is composed of columns of cells containing highly refractive lipoid granules and is derived embryologically from the interrenal buds of the Wolffian body, thus demonstrating the close relationship to the gonads. The cortex stimulates the cells of Leydig and the luteal cells of the ovary, has an important relation with the development of the cerebral cortex (in ancephalic monsters there is absence of adrenal cortex) and probably inhibits skeletal growth. It hyperplases in pregnancy. Tumors of the adrenal cortex cause premature sex development and accentuation of secondary sexual characteristics. Thus a boy with tumor of the adrenal cortex shaved his beard at the age of five. This structure has properly been called the organ of masculinity. An increase in its size has been noted after thyroidectomy (8).

Addison's disease, a chronic condition caused by adrenal hypofunction, is characterized by great asthenia, marked gastrointestinal symptoms, pigmentation of skin and mucosae and by vasomotor insufficiency. This represents a terminal picture of adrenopathy for which there seems to be no therapeutic help. But there are individuals who are to be termed adrenotrops who possess symptoms of

adrenal insufficiency who, if recognized, may be prevented from progressing to complete adrenal collapse. There can be little doubt that a predisposition to this condition is inherited as are other endocrinopathies. It may also be produced by infections like influenza, diphtheria and tuberculosis. These individuals show tendency to easily fatigue, pigmented areas on skin and mucosae, areas of mottling and the characteristic Sergeant's white line. The use of aspirin or the administration of anesthetics or salvarsan to these patients may be fraught with grave danger unless adrenalin is easily accessible in case of adrenal collapse. The hyperchlorhydria accompanying the taking of aspirin or coal-tars in some patients is ascribable to hypoadrenia. Persons with an excess of adrenal function tolerate tobacco well because tobacco depresses the adrenals and causes a mild vasodilatation. The constitutionally predisposed hyperadrenal individual is apt to show lessened skeletal development because of the intimate relationship between the adrenals and the pituitary. After destruction of the former, the pituitary cells take on increased function. Teeth are late in erupting, incisors are like canines, laterals are small and atrophic. Extremities are cold and damp and there may be feminine distribution of hair. Removal of adrenals in rabbits produced a condition akin to osteomalacia (Bell).

The hyperadrenal type is energetic, highly aggressive, hairy and usually dominates or attempts to dominate his or her surroundings. The hyperadrenal Amazon is well known to everyone. In the female the uterus and ovaries are small, there is masculine pelvis and unless the condition is compensated for by the thyroid, there is ammenorrhea. Headache is common, due to stimulation of pituitary. The canine teeth are apt to be long and pointed.

Thymus.—Is originally a paired organ but unites early in foetal life. It is believed to stimulate lymphatic activity and, during youth at least, inhibits the gonads and calcium retention. Removal of this gland in young animals is followed by rapid sexual development with limitation of bodily growth (6). In failure of the thymus to involute at or about puberty, there occurs a lack of sex differentiation and the development of sex organs is arrested. Removal of the gonads causes hyperplasia of thymus (28). The postadolescent hyperthymic has soft, velvety skin, hair fine, little mustache or beard, sparse pubic hair and, in males, a feminine distribution of hair, and, in females, delayed or absent menses (19). Removal causes delayed dentition (28). Although the grandular

structures of the thymus atrophy at puberty, the capacity to again proliferate continues. It is excited by intestinal toxemia and inhibited by adrenalin and X-ray. Thymectomy in children is followed by a disturbance in growth. This is important in consideration of the effects of X-ray on children.

Pineal.—This gland inhibits development of gonads. In fowls, its removal stimulated bodily growth and increased sex characteristics (4). The feeding of pineal extract accelerated metabolism in amphibia. Fulton found that it inhibited the growth of testicles (25). It is possible that the adiposity, hyperglycemia and polyuria observed in cases of pituitary and pineal tumors are due to internal hydrocephalus and pressure on structures in the midbrain, as claimed by Luce (26).

Gonads.—These comprise the luteal cells of the ovary and interstitial cells of Leydig of the testicle. These structures contain acidophilic and basophilic granules similar to those of adrenal cortex and like them are of mesodermic origin. They reciprocate with the thyroid and anterior pituitary. They probably inhibit action of thymus and atrophy after removal of pancreas (14). They appear to act as a curb on adrenals for after atrophy of the gonads the adrenals function less restrainedly and high blood pressure and other evidences of adrenopathy develop. The physical changes occurring after complete removal of ovaries and testicles are too well known to need repetition at this time. In connection with orthodontia it may suffice to call attention to the observation of some writers that in gonadotrops the lateral incisors do not develop normally. Skeletal changes occur in castrated animals and the shortened stature of inhabitants of warm countries may be due to early maturity of the gonads (28). Rabbits fed on ovarian extract showed softer enamel and therefore shorter incisors, due to wear, than control rabbits (Broderick).

Pancreas.—This structure is a gland both of external secretion and internal secretion. The islands of Langerhans contained in the tail of the pancreas are of the latter variety. The function of its harmone is believed to be that of stimulating the storing of glycogen in the muscles and liver, in other words, it acts as a check on the liberation of this energizing substance. An inhibitory effect on the adrenals and thyroid is present. After its removal in cats, and in juvenile diabetes, the eosinophils of pituitary disappear and the thyroid first enlarges and then becomes smaller, the lipoid disappears from the adrenal cortex while the adrenal medulla stains

more deeply with chromic acid and the gonads and pineal become smaller (14).

Nothing will be said regarding the tonsils, mammary, spleen and liver as possible endocrine agents, as their influence on growth and development are problematical, although evidence that they possess endocrine functions is accumulating.

It is realized by the writer that many of the foregoing statements may appear to be dogmatic. Many of the functions ascribed to particular endocrines are still the subject of controversy. He has selected what appears to be the weight of evidence and what has accorded with his own clinical observations, in the hope that interest among medical officers who have great opportunity to study large numbers of men of widely varying types may be aroused in this important subject and that most of the phenomena connected with growth and development and with temperamental tendencies and inborn characteristics of individuals may be at least partially explained on the basis of endocrine malfunctioning.

At the United States Disciplinary Barracks, where among the prison population problems of this kind are constantly arising, a scheme of endocrinological examination has been devised and successfully used. This form is given below. It will be noted that it was planned for use in the examination of females as well as of males, for it has been demonstrated that, to date, the greatest field for endocrinotherapy has been in gynecology.

ENDOCRINOLOGICAL EXAMINATION

Name.....Date.....
Address or rank.....
Age..... Sex..... Marital condition.....
(Dates of changes).....
Family traits of endocrinopathy.....
.....
.....
Age begun teething..... Age finished milk teeth..... Age walked.....
Age talked..... Age started school ..... Age finished school.....
Grade reached..... Occupations (dates).....
.....
.....
Age onset menses..... Frequency at different periods of life (details)
.....
.....
Character of menses at different periods of life (details).....
.....
.....

Nose bleeds..... Vicarious menses.....
Sexual history (age onset puberty, age began to associate with opposite sex, present sexual traits, etc.).....
.....
.....
Pregnancies (dates, children viable or still-born, still living, ages, physical condition, endocrinopathic characteristics, etc.) (For males, only parts applicable).....
.....
.....
.....
Past illnesses.....
.....
.....
.....
.....
Present subjective complaints.....
.....
.....
.....
.....
.....
.....
History of enuresis, polyuria, diminished amount urine.....
.....
Headaches, drowsiness, fatigability, tired in morning, increased need of sleep
.....
.....
.....
Symptoms referable to heart (tachycardia, palpitation, precordial pain, "crises-like" attacks, etc.).....
.....
Gastro-intestinal symptoms (constipation) (details) .....
Diarrhea (details).....
Viscero-spasms, gas, hyperchlorhydria, atonia, pain, vomiting, appetite, etc.
.....
.....
.....
Pains along nerve trunks, regional pains, in extremities, etc.....
.....
.....

PHYSICAL EXAMINATION

Weight now..... Usual..... Ages of marked changes.....
Pulse rate..... Volume..... Blood pressure: S....D.... Temperature.....
General appearance (childish physique, precocious growth, appearance of disproportionate age, awkwardness, gait disturbances, stature, dwarfism, infantilism, gigantism, chubby, large or small bones, slender, lean, bow-legs, kyphosis, general contour, breasts, etc.).....

.....
.....
Skin (Vasomotor reactions, white line dermographia, flushed, blushes easily, moist, pale, dry, cold, warm, thick, infiltrated, swollen, soft and supple)
.....
.....
.....
Head (shape of skull, jaws, X-ray of sella turcica).....
.....
.....
Face (malformations, pudgy, broad, narrow, etc.).....
.....
Tongue (large rolling, narrow, thin).....
Teeth (late dentition, spacing, shape of palate, irregular, size, wide molars, early loss of teeth, caries).....
.....
Adiposities (regional or general).....
Extremities (size in relation to rest of body, joints, feet and hands, small or large).....
.....
Nails (brittle, cracked, ridges, curved, excessive size, absent).....
.....
Lymphatic glands (adenopathy, adenitis, relation to tonsil, operations, etc.)
.....
.....
.....
.....
Genitalia (size, deformity, pathology, cryptorchism, ovarian tenderness, size, position and pathology in uterus, etc.).....
.....
.....
.....
Abdominal (tenderness, size of liver and spleen, tympany, gurgling, masses, etc.).....
.....
Heart (rate, position, rhythm, pathology, reaction to exercise and rest, etc.)
.....
.....
.....
Lungs (pathology, glands, enlarged thymus, etc.).....
.....
Thyroid (palpable).....
Goetsch or other function tests.....
Blood picture (differential count, leucocytosis, red cell count, hemoglobin, etc.).....
.....
Coagulation time (estimated or determined) (increased or decreased).....
.....
Urine examination.....
Test for basal metabolism.....

Sugar tolerance test.....
X-ray (sella turcica thymus, stomach and intestines for motility, epiphyses, etc.).....
.....
Mental status (mood, stream of mental activity, speech, memory, orientation, dream states, emotional variation, phobias, compulsions, delusional formation, hallucinations) (look for sluggish or quick decisions, excitable or phlegmatic temperament, irritability, restlessness, wittiness, active winking, sluggish or rapid motor reactions, mental deterioration).....
.....
.....
.....
.....
.....
.....
Information received from sources other than history as given by patient or by physical examination.....
.....
.....
Remarks (for data for which space is not given in form above).....
.....
.....
.....
.....
.....
.....
Conclusions, summary and diagnosis.....
.....
.....
.....
.....
.....
.....
.....
Treatment.....
.....
.....
.....
.....
.....
.....
.....

REFERENCES

(1) Arch. Int. Med., March 15, 1921, p. 305.
(2) Vincent and Jolly: Jour. Physiol., 1905, 32, 65; 1906, 34, 295.
(3) Paton and Findlay: Quart. J. Exp. Physiol., 1916, 10, 214.
(4) MacLoed: Phy. and Biochemistry; 3d Ed., C. V. Mosby Co., 1920.
(5) Vincent and Arnason: Endocrin., 1920, 4, 199.

(6) Faught and Ryan: A. J. Med. Sc., Nov., 1922, clxiv, 646.
(7) Bell and Hick: Brit. M. J., 1909, 1, 157.
(8) Bell: "The Sex Complex"; Wm. Wood & Co., 1916, p. 54.
(9) Wilson: A. J. Med. Sc., 1916, 152, 799.
(10) Klinger: Arch. f. d.: ges. Physiol., 1919, 177, 232.
(11) Smith: Anat. Record, Phila., 1921, 21, 83.
(12) Ed. J. A. M. A., 1917, 69, 16, 97.
(13) Cushing: Pit. Body and Disorders, 1st ed., Lippincott.
(14) Kraus: Munchen Med. Wochensch, 1921, 68, 794.
(15) Loffler: Abst. in Endocrinology, 1921, 5, 803.
(16) Paton: Quart. Jour. Exp. Physiol., 1916, 214.
(17) Falta: Ductless Gland Diseases, Blackinson, 1915, page 176.
(18) Bucher: Schweitzer arch. f. N. u. P. Zurich, 1921, 8, 208. Abst. in (6) v. s.
(19) Timme: Neur. Bull., 1921, 3, 1.
(20) Eddy: Endocrinology, 1921, 5, 461.
(21) Blumgartin: Med. Clinic N. A., Sept., 1919, 3, 473.
(22) Vallery-Radot: Lancet, Jan. 7, 1922, Abst. Yr. Book, 1922, Vol. 1, 116.
(23) McKinlay: Arch. Int. Med., Dec., 1921.
(24) Fraenkel: Deutch. Arch. f. klin. Med., 1921, Abst. Yr. Book, 1922, Vol. 1, 134.
(25) Fulton: J. A. M. A., Nov. 5, 1921.
(26) Luce: Deut. Zeit. f. Nerv., Jan. 13, 1921, Abst. Yr. Book, 1921, Vol. 8, 160.
(27) Prosser: Dental Cosmos, 1921, 63, 808.
(28) Broderick: Dental Cosmos, 1921, 63, 135.
(29) Bolin: Military Surgeon, Nov., 1922.
(30) Abstract from Carrieux, Int. Dig. Organotherapy, April, 1923, 1, 29.
(31) Carpenter and Ferguson: U. S. Naval Bul., April, 1923, 18, 417.

ASSOCIATION NOTES

COMING MEETING AT CARLISLE BARRACKS, PA. OCTOBER 4-6, 1923

In response to inquiries regarding the question of accommodations during the period of the coming meeting at Carlisle Barracks, the following information has been furnished by Col. P. M. Ashburn, M. C., the present Commandant of the Medical Field Service School. Effective with the first of August, 1923, Col. Charles R. Reynolds, M. C., U. S. Army, will succeed Colonel Ashburn as Commandant of the school:

1. The accommodations for members of the Association at Medical Field Service School:

(*a*) Room, bed, bedding, towels, bedroom service and laundry, $0.50 per day.

(*b*) Mess and dining-room service, $1.50 per day; no rebate for meals missed.

Approximate cost of above to each member, $2.00 per day.

Bed rolls need not be brought, and either uniform or civilian clothes may be worn.

2. Following is a list of principal hotels at Carlisle and Harrisburg, and the prices quoted by each:

Hotel Carlisle:

Rooms without bath, single	$2.00
Rooms without bath, double	4.00
Rooms with bath, single	2.50
Rooms with bath, double	4.50 and up

Meals a la carte.

Hotel Argonne:

Rooms	$1.00
Rooms, with running water	1.50

Separate baths—Meals a la carte.

Hotel Wellington:

Rooms, single	$1.50 and $2.00
Rooms, double	2.50 and 3.00
Rooms with bath, single	2.50
Rooms with bath, double	3.50

Meals, American and a la carte.

Hotels—Harrisburg

Penn-Harris:

Rooms without bath	$2.50
Rooms with bath	$3.00, $3.50, $4.00

Meals a la carte.

Hotel Columbus:

Rooms without bath	$2.00 and $2.50
Rooms with bath	3.00 and 3.50

Meals a la carte.

Bolton Hotel:
European plan..... $2.00 to $3.50
American plan..... 4.00 to 5.50
Senate Hotel:
Rooms without bath..... $2.00
Rooms with bath..... 3.00

3. There are no housing accommodations available for the entertainment of lady members of the families of delegates at Carlisle Barracks. There is an officers' recreation room, however (Red Cross House), which can be used as a hostess house and placed at the disposal of visiting ladies during the period of the convention; simple lunches such as milk, coffee, sandwiches, small cakes, etc., can be served to them there by the Post Exchange.

4. It hardly seems feasible to attempt to publish a schedule of trains entering and leaving Harrisburg, as the number of them is so great and each man will have to look up his own, depending upon the part of the country from which he comes.

Following is a list of trains between Harrisburg and Carlisle:

Leave Harrisburg	*Arrive Carlisle*	*Leave Carlisle*	*Arrive Harrisburg*
4:45 A.M.....	5:33A.M.	2:37 A.M.....	3:10 A.M.
7:05.....	7:58	5:20.....	6:05
8:15.....	8:54	7:00.....	7:45
9:48.....	10:30	8:40.....	9:12
11:59.....	12:37 P.M.	10:45.....	11:20
3:23 P.M.....	4:03	12:46 P.M.....	1:25 P.M.
3:40.....	4:16	2:06.....	2:40
5:20.....	6:05	4:40.....	5:25
5:45.....	6:28	5:45.....	6:15
6:30.....	7:15	6:17.....	6:57
7:45.....	8:20	8:35.....	9:15
11:10.....	11:45	12:06 A.M.....	12:40 A.M.

It will be feasible to have Carlisle trains met by representatives of the post and to furnish transportation from the station in Carlisle to the post. It would not be feasible or necessary to attempt to run a bus line between the post and Harrisburg as the train schedules are good and in addition there is a trolley line between the two places, running cars hourly.

5. There will be a room available as the office and headquarters of the Association.

The tentative program, subject to possible change, is as follows:

Oct. 4: Preliminary Meeting, Reports, Demonstration of New Equipment of Medical Troops and Units, Demonstration of Medical Field Service School, Parade and Review, and Dedication of Bronze Tablet Commemorating the Services of the Officers, Nurses, Enlisted Men and Others who Served in the Medical Department During the World War; in the evening a Public Reception and Dance in the Gymnasium.

Oct. 5: All Day Demonstration of Lines of Medical Aid from the Firing Line back to and including the Field Hospital

Oct. 6: Final Meeting, Election of Officers, Presentation of Papers. Adjournment. Probably a visit to Gettysburg Battlefield.

COMMENT AND CRITICISM

ALUMNI DINNER, SOUTHERN MEDICAL ASSOCIATION MEETING

The following notice has been received from Dr. Tom A. Williams, chairman of the Alumni Dinner for the Southern Medical Association meeting:

"During the meeting of the Southern Medical Association it is hoped that the alumni of each of the Medical Schools represented will meet together at dinner. The evening of Wednesday, November 14, has been set apart for that purpose and dining-rooms have been already engaged.

"The committee desires to know approximately the number of diners to be expected at each of these reunions. Those who expect to attend should therefore notify Dr. Tom A. Williams, at 1746 K Street N.W., Washington, D. C., by the end of October."

THE 1923 BASIC FIELD COURSE OF THE MEDICAL FIELD SERVICE SCHOOL, CARLISLE BARRACKS, PA.

For Medical, Dental and Veterinary Officers of the Regular Army, and Selected Officers of the National Guard and Organized Reserves

1. The work of this school is divided among five teaching departments, each headed by a director. These are the departments of Hygiene, Military Art, Enlisted Training, Equipment and Transportation, and Administration. There are also a senior dental representative and a senior veterinary representative who work with all five departments and adapt their work to the special needs of the dental and veterinary services.

2. The 1923 Basic Course begins September 1 and ends December 22, 1923. The academic hours are from 8.00 a. m. to 12 noon, and from 1.00 p. m. to 3.00 p. m., Saturday afternoons, Sundays and holidays excepted. The hours from 3.00 to 5.00 p. m. on Mondays, Tuesdays, Wednesdays and Fridays are devoted to Equitation and Athletics.

3. The following is a summary of the 1923 Basic Field Course:

SUMMARY, 1923, BASIC FIELD COURSE

Medical Field Service School, Carlisle Barracks, Pa.

Subject	Number of periods					Total hours
	Conference	Lectures	Map problem	Map sketching	Demonstrations and field exhibits	
Opening of School	1	.....	.....	.....	.....	1
Tactics and Technic of Separate Branches	3	10	.....	.....	.....	13
Tactics and Technic of the Medical Department	3	17	.....	.....	.....	20
Map Problems and Solutions	.....	.....	13	.....	.....	24
First Aid	5	1	.....	.....	.....	6
Map Sketching and Reading	6	2	.....	6	.....	24
Military History	.....	6	.....	.....	.....	6
Establishment of Medical Department Formations	.....	.....	.....	.....	.....	20
Mounted and Dismounted Pack, Tent Pitching	.....	.....	.....	.....	12	20
Pistol Practice	.....	.....	.....	.....	1	8
Company Administration	.....	.....	.....	.....	5	9
Drill and Command	.....	.....	.....	.....	33	38
Interior Guard Duty	2	.....	.....	.....	2	6
Equitation	.....	.....	.....	.....	21	42
Hippology	.....	5	.....	.....	1	7
Military Hygiene	13	40	.....	.....	15	86
Courtesies and Customs	2	1	.....	.....	.....	3
Military Law	10	5	.....	.....	.....	18
Army Regulations and Paper Work	48	1	.....	.....	.....	56
Equipment	9	5	.....	.....	4	20
Transportation	.....	6	.....	.....	10	32
Field Exercises and Maneuvers	.....	.....	.....	.....	2	47
Extra Departmental Lectures	.....	4	.....	.....	.....	4
	102	103	13	6	115	510

4. The necessary texts are issued to the students, and, in addition, the school library contains a number of reference books which should be consulted freely by the students.

5. General discussion of the course: The course prescribed covers the following:

(*a*) *Military Hygiene:* This course lays special emphasis on the control of infectious diseases in the field, the duties of medical inspectors of divisions, the practical application of methods of control, the construction and uses of various types of sanitary appliances.

(*b*) *Equipment:* The object of this course is to give the student an elementary idea of logistics, to teach property accountability, the purchase, storage, and distribution of medical supplies.

(*c*) *Transportation:* This course is intended to give the student an idea of the importance of the transportation of an army, how to care for the animal-drawn and motor transportation and the movement of troops by water or rail.

(*d*) *Interior Guard Duty:* This course teaches the methods of holding formal and informal guard mounts, and the security of prisoners.

(*e*) *Field Work:* This course covers the methods of assembling the infantry and mounted packs, the pitching of shelter, pyramidal, wall, and hospital tents, the establishment of aid stations, ambulance stations, collecting station and hospital station, and pistol practice.

(*f*) *Drill and Command:* This course teaches infantry drill to include the battalion, litter drill, saber drill, and methods of giving commands.

(*g*) *Equitation:* Thirty hours are devoted to teaching the student the proper methods of riding and the methods of teaching equitation to the enlisted men of the Medical Department.

(*h*) *Hippology:* This course covers the points of the horse, the proper methods of feeding, watering, grooming, housing and shoeing animals, and, in addition, first aid to animals.

(*i*) *Courtesies and Customs:* The object of this course is to teach the students courtesies and customs of the Army.

(*j*) *Military Law:* The object of this course is to familiarize the students with the methods of conducting summary, special and general courts-martial, to teach the rules of land warfare and so much of commercial law as involves laws of contracts, notes, checks, etc.

(*k*) *Army Orders and Paper Work:* This course teaches the methods of preparing routine reports required by company and detachment commanders, the conduct of post exchanges, councils of administrations, how to keep guard rosters, duty rosters, to prepare pay rolls, pay vouchers, etc., to prepare the required medical department reports and returns.

(*l*) *Military History:* This course takes up the history of military medicine, the history of military art, the medical history of certain campaigns and the history of the medical department of the United States Army.

(*m*) *Tactics and Troop Leading:* The object of this course is to acquaint the students with the basic principles of organization and the organization of all combatant arms and staffs of an infantry division, to teach him the elements of the tactics and technique of the separate arms, and to show the relation between the various arms and the medical department and how they are combined into one smooth running machine. The organization and tactical employment of all medical department organizations with an infantry division is covered in great detail.

(*n*) *Map problems* are utilized to teach by the applicatory method the tactical principles brought out in the course. The methods of solving map problems, the technique of preparing field orders, and the discussion of problems are important features of this course.

(*o*) *Map Reading and Sketching:* Self-explanatory.

6. Methods of instruction: Instruction is imparted by means of conferences, lectures, demonstrations, job sheets and map problems. The primary object of the conference is to give the instructor an opportunity to enunciate and elucidate the principles and lessons contained in the text. The second object is to clear up any doubtful points that may exist.

7. At least one week of the course is devoted to a field maneuver. During this maneuver the students are given practical training in the conduct of marches, security on the march, the hygiene of the march, and the care of animal-drawn and motor transportation. Camp sites are selected, the methods of making camp, the sanitation of camp sites, field messing, purification of water supplies, the disposal of wastes, are parts of the instruction. Terrain exercises, tactical walks and problems in the tactical handling of medical troops are an important part of the field maneuver.

8. Field exercises showing the lines of evacuation from the aid stations on the line to the hospital stations in the rear are held at stated intervals in order that the student may appreciate the distances and the time factor with which the medical department of an infantry division is concerned.

AMERICAN PUBLIC HEALTH ASSOCIATION—FIFTY-SECOND ANNUAL MEETING

The American Public Health Association extends to the public health profession and others interested a cordial invitation to attend its Fifty-Second Annual Meeting in Boston, Mass., October 8 to 11. Headquarters will be at the Copley-Plaza Hotel.

The annual meetings of this association are always important events in the public health world, but the meeting this year is of more than usual interest since it ends the first twelve months of the new program adopted as a result of the association's reorganization in 1922. Two general sessions and twenty-six meetings of the scientific sessions will be held this year. In addition, many trips of technical and general interest have been planned around historic old Boston as part of the entertainment and educational program. On Monday evening, October 8, the formal opening session will be followed by a reception. On Wednesday evening, October 10, Sir Thomas Oliver, distinguished English industrial hygienist, and Dr. George E. Vincent, president of the Rockefeller Foundation, will address the second general session. The scientific program, embracing all branches of public health, will be held according to sections as follows: Public Health Administration, Laboratory, Sanitary Engineering, Vital Statistics, Child Hygiene, Food and Drugs, Industrial Hygiene, Public Health Nursing, Health Education and Publicity.

Among the important subjects scheduled for discussion are papers on food inspection, growth of children, full-time health officers, mental hygiene in the school program, nutrition work, the effect of so-called moonshine liquors, standards for schoolhouse construction and sanitation, epidemiology, better birth registration, organic heart disease, studies on the etiology of common colds, water supply and purification, mosquito control, etc.

An important report of the Committee on Municipal Health Department Practice will be presented in the Public Health Administration Section. At this time the announced plan for the awards to cities for distinctive community service will be discussed. The problems of health officers in small communities will be specially considered at a Round Table discussion scheduled for Wednesday morning. The clinic on Printed Matter, which has proved valuable in past years, will be held again this year by the Section on Health Education and Publicity. At this clinic, samples of public health publicity will be examined and criticized by experts. Of special interest also is the report of the Committee on Health Problems in Education of the Child Hygiene Section.

The September issue of the *American Journal of Public Health* carries the preliminary annual meeting program arranged by sections, and the October journal will contain additional information. Members of the association, traveling by rail to Boston, may secure a reduction of one-fourth the regular round-trip rate.

BOOK REVIEWS

History of the Great War, based on Official Documents; Medical Services, Hygiene of the War, Volume I. Edited by Maj. Gen. Sir W. G. Macpherson, K.C.M.G., C.B., LL.D. Col. Sir W. H. Horrocks, K.C.M.G., C.B., and Maj. Gen. W. W. O. Beveridge, C.B., C.B.E., D.S.O., K.H.P. London: His Majesty's Stationery Office.

This is the first of two volumes of the British Medical History of the War devoted to a consideration of the Hygiene of the War, the subjects by chapters of which are as follows:

I. Sanitary Organization in the Field.
II. Schools of Sanitation and Instruction in Hygiene.
III. Purification of Water.
IV. Water Supply in France and Belgium.
V. Water Supply in Egypt and Palestine.
VI. Character of the Water in North Sinai.
VII. Character of the Water on the Wadi el Ghuzzee near Gaza.
VIII. Water Supply in Mesopotamia.
IX. Water Supply for British Troops in Italy.
X. Water Supply in Macedonia.
XI. Water Supply in North Russia.
XII. Disposal of Waste Products.
XIII. Conservancy in North Russia.
XIV. The Housing of the Soldier.
XV. The Clothing of the Soldier.
XVI. The Hygiene of Transports.

In the preface of this volume a striking illustration of the results of recent advances in sanitation and preventive medicine is presented. Among the British troops in the South African War, with an average strength of 208,000 and an aggregate strength of 530,000, the incidence of typhoid fever was 58,000 with 8,000 deaths, whereas for the period 1914-18 with an average strength of 1¼ millions and an aggregate strength of three or four times that number, the incidence of typhoid and paratyphoid on the western front was less than 7,500 with only 266 deaths. For the corresponding periods the admission rate for dysentery in South Africa was 86 per 1,000, while on the western front 6.18 per 1,000 was not exceeded in any year.

The reader's attention is here invited to the fallacy of comparing deaths and inefficiency from diseases with battle casualties as the ratio mainly depends upon the number and extent of battles. The empirical figure 0.3 was accepted as the permissible limit of inefficiency from disease, of an army in the field.

Chapter I deals with the organization of the Sanitary service in France, the organization in the United Kingdom having been considered in a previous volume, and describes the successive stages of expansion, of the well-organized personnel of 7 officers and 116 men which accompanied the first expeditionary force to France, to 17,000 officers and men in the various theaters of war at the time of the armistice. This service was directed by an A. D. M. S. on the Staff of the D. M. S. Officers were chosen preferably from medical officers of health, holders of diplomas of public health, surveyors, architects,

teachers, chemists, carpenters, experts in sanitation, plumbing, engineering and similar professions or trades. A sanitary section consisting of 1 officer (captain or lower grade), 2 sergeants and 23 men, was allotted to each base and division, and a sanitary squad, composed of 1 sergeant and 5 men, to each railhead, advanced base, and permanent post on lines of communication. Also a regimental personnel of 1 N. C. O. and from 2 to 8 men was assigned to each unit, and, additionally, 1 corporal and from 2 to 4 men of the R. A. M. C. specially trained for water duties. The sanitary personnel was supplemented on occasion by personnel from labor battalions, divisional employment companies, and by soldiers incapacitated for front-line duty. A member of the sanitary service was assigned as sanitary inspector to each town commandant. Water arrangements and purification, billeting arrangements, and the disposal of refuse, was directed by the sanitary section of the division occupying the area involved. A Hygiene Mobile Laboratory, primarily for water analysis and purification but which proved of great value also in examining foods and detecting poisons, was assigned to each army. After the first year of the war a water committee, composed of the Deputy Engineer-in-Chief, an officer of the G. S. and the A. D. M. S. for sanitary service, was charged with devising plans for water supply and purification. Reports and notifications relative to the occurrence of infectious diseases are discussed here also.

Chapter II describes the special training given the sanitary personnel, to which, together with the general hygienic training given all troops, the success attained in sanitation is attributed. Schools were established in various theaters of war and commands, the teachings of which were superimposed upon the sound basis of the instruction previously received at three sanitary schools in the United Kingdom, viz., the London Sanitary Cos., the School of Army Sanitation at Leeds (which was primarily established for training American medical officers serving with the British), and the R. A. M. C. School of Hygiene at Blackpool.

The instruction was practical, and this chapter abounds in illustrations of models of incinerators, disinfestors, ovens, latrines and various contrivances easily improvised, indicative of resourcefulness and ingenuity.

Chapter III in a consideration of water purification interestingly describes experimentations with apparatus involving the principle of filtration through compressed sponges and earthenware candles, and of heat, during a period shortly preceding the war, which were proved impracticable for field use. The chlorination process was adopted and used generally. Methods and plants for rendering poisoned waters potable are described, and the water purification barges described and illustrated are interesting. The Wallace-Tiernan chlorinator which employed chlorine gas is described with the conclusion that water thus treated is more potable than that treated with chloride of lime.

Chapter IV deals with water supply in France and Belgium, where each corps appointed a water supply officer and army troops performed the work of installation in accordance with plans approved by the Chief Engineer of the Army. "Initial water points" were established from which water was pumped through a system of pipe lines to tanks variously located; advanced pumping stations pumped water to "forward water points" consisting of canvas tanks, and, in some instances, even to the front-line trenches. Filtra-

tion barge units were considerably used but were not generally satisfactory. It is concluded that sterilization by chloride of lime is efficient; that water columns provided with motor purification plants of the chlorine gas type are more satisfactory, especially in an advance, and that it is advisable that water supply and purification be under the supervision and control of a water committee at G. H. Q. composed of representatives of the G. S., the Chief Engineer, the D. G. M. S. and the Director of Transport, and also that there be a committee of similar composition with each army.

Water supply in the various other theaters of war are discussed in the succeeding seven chapters. In Egypt, when it was not practicable to extend the systems of the principal towns, three sources of supply were utilized—deep wells, the Nile, and condensation. In the Suez Canal area, water boats and barges, and camels were used, and later water from the Sweet Water Canal was distributed by a pipe system. Extensive engineering was necessary in Egypt and on the Suez Canal, the water being sedimented, filtered and chlorinated before distribution by pipes. Chlorination as ordinarily practiced was not sufficient to destroy cercariae, and it was necessary that the germs of all water-borne diseases be destroyed. In the advance to El Arish water was piped 96 miles, and this was later extended.

In Palestine, wells were used to a great extent and were commonly infested with leeches which were destroyed with chlorine gas.

The supply in Mesopotamia was mainly from the Shatt el Arab, Euphrates, Tigris, and its tributaries. Sterilization of the drinking water was not officially employed until 1916 after outbreaks of cholera and epidemic jaundice were attributed to the water. 0.8 parts chlorine per million parts water was found sufficient for the usual type of water found in Mesopotamia. Filtration and sterilization barges were used with satisfaction on the Tigris. In Italy, the supply was derived chiefly from springs in the Venetian Plain and was pumped as required to the Asiago Plateau. The river Curogna and the Brentella Canal, fed by the river Piave, were also utilized. In the mountain area the supply was limited to one gallon per man for all purposes and the use of melted snow for washing purposes encouraged. Gas chlorinators were employed successfully, and here, too, a Water Board Committee was constituted. Access to the archives of the Italian Public Health Medical Service, which contained a complete detailed record of the water resources of the country, was of inestimable value.

Springs, both deep and shallow wells, and aqueducts provided the supply in Macedonia, some of the latter utilized being probably of Roman origin. Most of the surface water showed marked contamination, while that from the deep wells required no chlorination. The supply in Gallipoli was obtained by condensation and conveyance from Egypt.

In North Russia the supply was mainly from lakes, wells and rivers, most often from rivers which were generally discolored by peat. A fairly modern water system was found at Archangel, but that of other towns was crude.

Chapter XII discusses the disposal of waste products and abounds in illustrations of improvised incinerators, latrines, grease traps and other ingenious devices of various types. Unique among these is a urinal constructed by letting funnels into a large ant heap which was used with success at Dar-es-Salaam. The most satisfactory method of disposal of fecal matter

was by a scheme of incineration after collection from fly-proof receptacle latrines, by trained personnel. The problem of disposing of ablution water was solved by a method of treatment with slaked lime which rendered it suitable for repeated use. Wastes generally were variously disposed of by incineration, burial, dumpage at a distance, or cesspools, depending upon the territory occupied and the existing conditions. This problem presented unlimited opportunities to the practical minded medical officer, as field sanitary appliances are determined more by local conditions and available material and facilities than by preconceived theories, and many ingenious contrivances resulted, born of necessity.

Chapter XIII entertainingly describes the obstacles overcome in North Russia where the inhabitants were, in greater part, ignorant of sanitary measures, and where the break of frost inundated the occupied areas with the winter's accumulation of refuse and filth. A unique special railway latrine train is here described.

Chapter XIV is devoted to a discussion of the housing of the soldier under headings of the various theaters of operations, and hospitals of the hut type are also considered with profuse illustrations, though hospitals generally were discussed in a previous volume. Generally huts were preferred to tents on account of their longer duration and less expense. Exigencies of the situation demanded an allowance of a minimum of 40 square feet floor space and 400 cubic feet air space per bed, in billets, barracks or hired buildings. In the hutted hospitals the allowance was at first 80 square feet and 800 cubic feet, but in 1915 the floor space was reduced to 60 square feet, without untoward result until the influenza outbreak. It is stated that 60 square feet floor space can be justified only by the exigencies of war.

Billeting was found less expensive than tentage and occupancy of hired buildings with central messing facilities more economical than billets with subsistence. The familiar Nissen huts, for both barrack and hospital use, are described and illustrated. In Macedonia, the hospitals were either hutted or under canvas and in Mesopotamia a reed and matting type of construction was employed. In Egypt and Palestine, canvas was necessarily utilized generally. In North Russia, the housing was good though somewhat overcrowded, and consisted of billets, barracks, rolling stock, block houses and tents. The buildings generally were of heavy log construction with double walls poorly ventilated, which was corrected usually by cutting trap doors in the ceilings. Temperature was well maintained at 56° F. by means of cylindrical wood stoves.

Chapter XV deals with the clothing of the soldier and, after a brief historical review of the evolution of the soldier's kit, discusses the subject in its various phases with reference to the different theaters of war, chiefly from a climatic standpoint. The importance of preserving cleanliness of the underclothing is stressed. Much attention was given the disinfection and disinfestation of clothing and more especially so after the demonstration early in 1918 that the body louse is the causative factor in trench fever, steam being the principal agent employed. The subdivision of this chapter on clothing in North Russia is of particular interest.

The concluding chapter considers the hygiene of transports which assumed vast importance due to the reduction of shipping by enemy submarines, the

large number of troops to be carried, the necessity for keeping port holes closed in submarine infested areas, and the influenza epidemic. The arrangement of hammocks, latrines and urinals, ventilization, ablution, water supply and sterilization, and hospital facilities are in turn discussed. Regulations required the provision of 4 latrine seats for each 100 men up to 300, and 2 for each 100 above 300; 4 wash basins for each 100 men; 2 berths for each 100 men in a hospital for ordinary cases, and 1 berth for each 100 men in an isolation hospital for infectious cases, on each transport. Fifty square feet deck area and 400 cubic feet air space was required for each hospital cot. Routine inspections were made of ships hired for the conveyance of troops, prior to embarkation, the main object of which was to determine adequacy of ventilation, suitability of decks for berthing, and to insure against overcrowding. It is stated that after outbreaks of influenza among New Zealand and American troops which are described, measures to improve the health of troops aboard ship were directed on two lines, the one medical and the other structural, which are summarized as follows:

Medical: (1) Inspection of draft to secure that only healthy troops are embarked. (2) The prophylactic employment of an anti-catarrh vaccine.

Structural: (1) Arrangement of berths to secure sufficient floor space for each man so that he may be outside the maximum area of droplet infection from his neighbor. (2) Provision of sufficient cubic space to enable air to be renewed without the production of draughts. (3) Provision of sufficient fresh air, warmed in temperate climates and cooled in the tropics. (4) Provision of spray chambers and disinfectors."

A table presented of admissions per 1,000 of diseases of the throat and respiratory system, and minor septic diseases, for the years 1911-13 when ports could be kept open, and the troops freely exercised on decks, shows that the incidence of these diseases on board ship was over 100 percent more than that in barracks.

A prophylactic vaccine consisting of B. influenzae 60 millions, diplococcus pneumoniae 200 millions, and streptococcus pyogenes 80 millions, in 1 c.c., was employed in 2 doses of ½ and 1 c.c. respectively at ten days' interval, with considerable success, both on transports and in the army.

Appendices give synopses of the courses of instruction at various schools of sanitation and methods in detail of water purification and sterilization with an illustration of a portable chlorine gas sterilizing plant.

The volume is well and entertainingly written, the subject matter well arranged and generously embellished with appropriate and instructive illustrations and drawings, and makes interesting reading, in addition to its practical value, not only to all military officers but also to the worker in any phase of sanitation and hygiene.

History of the Great War, based on Official Documents, Medical Services. Diseases of the War, Volume II, including the Medical Aspects of Aviation and Gas Warfare, and Gas Poisoning in Tanks and Mines. Edited by Major Gen. Sir W. G. MacPherson, K.C.M.G., C.B., LL.D.; Major Gen. Sir W. P. Herringham, K.C.M.G., C.B.; Col. T. R. Elliott, C.B.E., D.S.O., and Lieut. Col. A. Balfour, C.B., C.M.G. London: His Majesty's Stationery Office.

The subjects, as arranged by chapters, considered in the second of the

two volumes of the British Medical History of the War descriptive of diseases, are as follows:

I. Neurasthenia and War Neuroses.
II. Skin Diseases.
III. Venereal Diseases.
IV. Medical Aspects of Aviation and Examination of Candidates.
V. Tests for Flying Efficiency and Flying Strain.
VI. Oxygen Administration and Oxygen Apparatus in Aviation.
VII. Influence of Gas Warfare on the Medical Services.
VIII. Characteristics, Classification, and Methods of Employment of Poisonous Gases.
IX. Development of Gas Warfare.
X. Protective Measures against Warfare Gas.
XI. The Acute Lung Irritant Gases. Pathology.
XII. The Acute Lung Irritant Gases. Symptoms and Treatment.
XIII. Vesicants. Mustard Gas.
XIV. Lachrymators, Paralysants and Sensory Irritants.
XV. Poisonous Gases Not Used for Offensive Purposes.
XVI. The Handling of Gas Casualties.
XVII. Invalidism from Gas Poisoning.
XVIII. Medical Problems in Tanks.
XIX. Gas Poisoning in Mine Warfare.
XX. Carbon Monoxide Poisoning in Mines.
XXI. Mine Rescue Work.

While the chapters on the subjects considered in this volume, as in the preceding one on diseases, were written by preeminent authorities on the respective subjects, it is stated in the preface that the work of the authors was supplemented by contributions on the subjects of neurasthenia and war neuroses, and the ear in relation to aviation, by others whose names do not appear in the list of contributors.

It may be said that the importance attained during the World War by the development of the war neuroses probably warrants more space than the one chapter devoted to this subject, the text of which is replete with the interesting information which is of great value to the medical profession and the psychologist, though no important addition to the symptomatology developed, notwithstanding the large incidence of nervous and mental disturbances.

It is stated here that nervous disorders, though not unknown in the original expeditionary force (a report in December, 1914, showing that 7 to 10 per cent of all officers and 3 to 4 per cent of all enlisted men admitted to hospitals in Boulogne were sent home affected by nervous and mental shock), did not become an acute problem until the battle of the Somme, July, 1916, when the arrival of large numbers of so-called "shell shock" patients in England caused much bewilderment.

In fact, misguided public opinion had raised the psychoneuroses to the dignity of a new war disease, before which doctors seemed well-nigh helpless. This view became rapidly widespread amongst the soldiers in France. . . . It wrought untold evil amongst patients and undoubtedly precipitated a breakdown in a certain type of man who might have otherwise held himself together . . . to the soldier's mind it was as much an entity as scarlet fever, with the further addition that, being incurable, shell shock was more to be dreaded. In quite a number of cases the eradication of this false belief from the patient's mind was all that was needed to effect a rapid recovery.

After the battle of the Somme, centers for diagnosis and treatment of nervous disorders were organized in each army area, though this was opposed by many in the fighting zone who "realized how thin was the line which separated the milder cases of psychoneuroses (and these formed the majority of the patients) from those individuals whose disability lay in an insufficient stoutness of heart" and "that the establishment of these special centers would open up a flood gate for wastage from the army which no one would be able to control." Cases admitted to these centers were sorted into the following groups: (1) simple exhaustion; (2) neurasthenia; (3) hysteria; (4) confusional and mental states; (5) miscellaneous medical conditions. The groups were segregated, and those not improving in ten days were evacuated to the base. The measures, which were largely psychic, employed in the treatment of psychoneuroses are described in detail. A study of the cases (573) in three army centers shows that only 10 per cent were recurrent and only 2.8 per cent had recurred twice or more, this indicating the success resulting from early treatment.

A total of 28,533 cases of "shell shock" were reported as battle casualties in France up to the end of 1917. Doubling this number to include those reported as sick and adding an allowance for those occurring in 1918, it is estimated that the total casualties from nervous disorders would be approximately 80,000, including many recurrent admissions. This is interesting when compared with statistical evidence showing that in February, 1921, 65,000 men were drawing pensions for disability due to neurasthenia and allied conditions.

Conclusions from the experience in France with the nervous disorders of war are summarized as follows:

1. In the forward areas, the majority of the patients when placed under suitable conditions rapidly improved.
2. The danger of confirming a patient's subjective symptoms if he were placed in a "sick atmosphere" was very great. Such patients were apt to be sent to England with their disorder firmly established.
3. Except when hospital accommodation at the base was overcrowded, only 10 per cent of cases admitted as N. Y. D. N. in the forward area needed evacuation to England.
4. The best results from both the medical and the military point of view were obtained when the nervous disorders were treated in a special hospital at the earliest possible moment, and for this purpose each Army N. Y. D. N. center should be within convenient distance of the front line. The organization should ensure that efficient segregation of patients into the necessary wards was possible.
5. Cases evacuated to the base from the Army N. Y. D. N. centers should be received into hospitals detailed for this special work.
6. Special medical officers for the various army centers and neurological centers at the base should be appointed, and the whole scheme for dealing with the subject of the psychoneuroses should be coordinated by a consulting neurologist, who should lay down the lines of treatment and define the scope of the work to be attempted in the forward areas and at the base.
7. A more intimate association between workers on the field and in the United Kingdom is essential for dealing successfully with the subject. The lack of coordination between the two was apt to produce deplorable results.

In the chapter on skin diseases it is observed that in one army in France in the later stages of the war the more common diseases were

scabies, infections of the skin, and pyrexia of unknown origin, and that these constituted 90 per cent of all the sickness. Impetigo generally occurred most prominently. Considerable space in this chapter is devoted to a consideration of Oriental sore (*Leishmania tropica*), of which it is estimated that 10,000 cases occurred in the Mesopotamia force.

The statistical data in the chapter on venereal diseases are incomplete, but the total number of cases treated for the period August 4, 1914, to November 11, 1918, is estimated at about 400,000, distributed as follows: Gonorrhea, 66 per cent; syphilis, 24 per cent; chancroid, 6 per cent; other venereal diseases, 4 per cent. The ratio of admission for all troops, British and Dominion, was greatest in Egypt and was greater in the United Kingdom than in France, due to the more general proximity to large towns in England. Venereal prophylaxis (voluntary and self-administered) was instituted first early in 1916, but the system was not generally adopted and put into operation until late in 1918, after which the venereal rate rose somewhat; little opportunity was afforded for a study of the results as the war had ended, and the cause of the increased rate is controversial. Special hospitals were established for the treatment of venereal diseases. Vaccines consisting of 1 part gonococci and 3 parts staphylococci were extensively employed in the treatment of gonorrhea, with results of distinct value.

In the consideration of the medical phases of aviation in three chapters, the observation is made that the province of the medical officer is not to identify by examination the popularly imagined "superman" pilot, but to eliminate the physically and psychologically unfit, selecting those who can be taught to fly. General methods and special tests for the examination of candidates are described.

Chapter six is devoted to the administration of oxygen in aviation and features the fact that high altitude symptoms are attributable to "oxygen want" rather than to atmosphere pressure changes. Excellent illustrations of the apparatus used are presented, and these chapters are of great value to the medical profession, military and civilian, concerned in aviation.

The greater part of this volume is devoted to a comprehensive consideration of the phases of gas warfare, and it is stated that the medical services bore the entire burden of combating this new weapon until October, 1917, when this responsibility was taken over by the Ministry of Munitions; "therefore the medical services may justly claim to have played a major part in all that concerns the defensive side of gas warfare, and the history of its medical aspects consequently goes much deeper into the subject than it would have done had the medical services been concerned only with the symptoms and treatment of those who suffered from gas poisoning."

Mention is made of the great advantage in gas warfare possessed by Germany, who so easily converted her industrial chemical plants into warfare gas manufacturies. The British began the production of warfare gas with one plant producing 1 ton of chlorine per day. By the end of 1915, 860 tons of this gas had been produced; in 1916 the British output of warfare gas was 5,150 tons; in 1917, 18,500 tons; and in 1918 (10 months), 15,500 tons.

Space, excellently illustrated, is given to a description of the evolution of the gas mask from the first "veil respirator" which consisted of a gauze-enclosed cotton pad impregnated with a solution of sodium hypophosphite, sodium carbonate, glycerine, and water.

A detailed and specialized arrangement for the initial handling of gas casualties was not generally employed, it being considered that while a system of segregation was preferable in stationary warfare, it led to confusion during great activity and rapid movements. In this connection, a brief description of the specialized organization for the treatment of gas casualities in the American Expeditionary Force is given and doubt expressed of its advantage over the British system, in the stress of general action.

The general classification of warfare gases is: (1) Acute lung irritants; (2) lachrymators; (3) direct poisons of the nervous system or paralysants; (4) sensory irritants of the eyes, nose and upper respiratory passages (sterunators); (5) vesicants.

As gas casualties progressively increased until they constituted 20 per cent of the total battle casualties, gas centers were established in army areas for cases not yet diagnosed, and these centers developed into convalescent centers for the lightly gassed. A broad classification of gas casualties was made as follows: (1) slight from the lachrymators and chlorarsines; (2) early acute—from the lung irritants; (3) late acute—from the vesicants.

Free consideration is given the pathology of the acute lung irritant gases. The common cause of death is asphyxia resulting from acute pulmonary edema.

Phosphene, trichlormethyl-chloroformate, and chloropicrin are considered the most lethal; chlorine, chlormethyl-chloroformate and phenyl-carbylamine-chloride the least; cyanogen bromide occupying an intermediate position.

Delayed cases of gas poisoning tended to appear in three forms: (1) Rarely in sudden death during the first day without premonitory symptoms; (2) in a rapid development during the first day of the ordinary features of pulmonary edema, even in its most dangerous form; (3) in a milder form three or four days after inhalation characterized by vomiting, abdominal pain, shortness of breath, fatigue, and often the temperature elevated a degree or two; cardiac distress and tachycardia might be present, and these never passed into a dangerous state. The essentials of treatment are rest, warmth, oxygen and venesection.

Mustard gas was found to be the greatest casualty producing agent among the warfare gases, and it is estimated that of the 160,970 gas shell casualties admitted to casualty clearing stations after the introduction of mustard gas (July, 1917) approximately 80 per cent were due to yellow cross, and 10 per cent to each blue and green cross shells. Of this total of 160,970 for the period July, 1917, to the end of the war, the mortality was 4,167 or 2.6 per cent. Due to the delayed action of mustard gas, these figures can be only approximate. The known total gas casualties in France from the commencement of gas warfare until the close of the war are given as 180,983 with a mortality of 6,062, the figures for April and May, 1915, when many died on the field or were taken prisoner, being approximated. In 1920 approximately 19,000 or about 12 per cent of the total gas casualties were receiving pensions, and these constituted about 2 per cent of the total disabilities arising from the war. The conclusion, from

a study of statistical data supplied by the Ministry of Pensions which is presented, is that neurasthenia, debility, disordered action of the heart and bronchitic attacks are the main sequelae to gas poisoning; few cases are seriously crippled, and "Pulmonary tuberculosis may be very slightly more prevalent among gas casualties than among other pensioners, but the increased incidence is trifling."

The last four chapters, as well as Chapter XV, deal with poison gases not deliberately used offensively and include nitrous fumes and carbon monoxide. These are treated comprehensively in relationship to the slow combustion of explosives, to tanks, and to mines.

The volume is well written, profusely illustrated, containing many colored plates, and maintains the excellent standard of the previously issued volumes of this history. Its contents are of great value to those of the laity interested in psychology, aviation, chemical warfare, or mining operations, as well as to the medical profession generally.

THE SURGICAL CLINICS OF NORTH AMERICA. June, 1923. Volume 3, No. 3. Philadelphia: W. B. Saunders Co.

Six times yearly the publishers save the reader of surgical literature and the ambitious surgeon who desires to keep in touch with the work of his colleagues in the United States trips to the diverse clinical centers. The June number introduces us to our San Francisco colleagues.

The menu served is rich and the food nourishing and palatable, and if the reviewer were to do no more than recite the diverse spiritual dishes, one would feel that even a glutton could find enough to satisfy hunger and thirst for knowledge for the next two months.

But more is expected of a reviewer. Without desiring to pause as a surgical authority, we may as well get rid of the disagreeable all the more to enjoy the good things.

The "Clinics" need an editor. The reviewer said the same thing some years ago when the late Dr. Murphy filled number after number of the series preceding the one under discussion; and he says so again, with this difference—that in the past the text needed revision, while now the subject matter needs editorial organization.

To illustrate the *raison d'être* of this statement, let us accept that the publishers actually take us—in spirit—to see the work done by distinguished San Franciso surgeons. As a matter of fact this statement is fully justified. We read and visualize work actually done, and whatever words by way of explanation are spoken in the operating room or at the bedside, can be heard through the text.

That is what the readers expect, desire and pay for. But what they do not expect is a lecture on a trite subject, and this should be eliminated. We have specific reference to a discussion on the ideal bone graft. Every senior knows that a bone transplant without periosteum and endosteum has not as good a chance for life as one with either the endosteum or periosteum or both.

Here and there the text, too, could be edited. For example, when a clinic is "interrupted" by a questioner as regards the anesthetic used, and the surgeon pauses long enough to give us a little talk on the advantages

of his particular method of general anesthesia (a method, by the way, practiced in the majority of American hospitals), the side-excursion distracts from the principal subject, and one is actually disturbed by the unnecessary interruption. If this interruption actually did occur, we venture to say the other members of the audience were saying to themselves things which would not look well in print, and if it did not occur, the question of anesthesia could have been given as a footnote.

And now to the good things. A Lucellian surgical feast awaits you, gentlemen. Go to it. You will be astonished at the wealth of material. If the subject happens to be a commonplace one—e.g., appendectomy, excision of knee joint, cervical rib, gastrojejunal ulcer, etc.—you will find new and original ideas well worth noting. But aside of this there is a treat in store for you, not frequently encountered even in large clinics. Calcification in brain tumors by R. R. Newell, peroral endoscopy by Wallace Bruce Smith, mesenteric cysts by Edwin S. Bartlett, aneurysm of the common iliac artery by Leo Eloesser, hemorrhage (intracapsalar) of the liver by Alanson Weeks are but a few of the rarer dishes presented in the present volume.

Twenty-four clinics, many presenting more than one interesting case, are at your disposal, and we feel it is unnecessary on our part to urge the readers to secure this volume, for the best way is to subscribe for a year. You will read the "Surgical Clinics" for the rest of your life.

G. M. Blech.

Diseases of the Rectum, Anus and Colon, by Samuel Goodwin Gant, M.D., LL.D. Three volumes. Philadelphia and London: W. B. Saunders Company. Price, $25.

When it is recalled that but a comparatively few years since proctologists have been ridiculed in their attempts to secure recognition as surgical specialists, when it is further recalled that even the now classic treatise of diseases of the rectum, anus and sigmoid flexure by Joseph M. Matthews of Louisville, a volume of over five hundred pages, failed to silence the criticisms on the part of many prominent surgeons, that proctologists were endeavoring to establish a diminutive specialty on a large one, one, naturally, is astonished at the imposing effort by Gant which resulted in the production of a work in three volumes with a text of 1,616 pages and with 1,128 illustrations and 10 insets in colors.

True, the regional extent of the specialty has been extended up to and including the "ileo-cecal angle," nevertheless the work must be looked upon as a monumental effort, and we Americans should hail such earnestness of purpose, undertaken and carried out at great personal sacrifice, as a contribution to our surgical literature, which will add luster to our technical achievements and scientific progress.

Considering the fact that the text is arranged in 97 chapters, the reviewer will not attempt to take these up singly but will endeavor to discuss the work as an entity.

The author lays claim to having presented a work which is not only *not* a revision of preceding publications from his pen on the same subjects, but a complete exposition of the diseases under consideration for the use of specialists, general practitioners and students.

We have no fault to find with this statement. There can be no doubt, after a thorough perusal of the work, that the author has omitted nothing noteworthy in his specialty and has, if anything, rather combed the literature for any contribution which, directly or indirectly, has any bearing on his specialty.

That there must be some overlapping with monographs and treatises on abdominal and, especially, intestinal surgery, goes without saying. Gant, however, has known so to discuss this class of subjects—e.g., appendicitis—as to merely round out his treatise. Nor is there anywhere any padding or even semblance of padding.

The first volume consists of 35 chapters, the last nine of which are devoted to hemorrhoids. The embryologic and anatomic studies are excellently presented and properly condensed into forty-three pages. The chapter entitled, "Manifestations Pointing to Ano-Rectal Disease" is, in the reviewer's opinion, too briefly sketched even though it is not intended to represent symptomatology.

The chapter on examination and diagnosis cannot be praised too highly. Even though many general practitioners and surgeons cannot be expected to utilize the diagnostic resources and aids taught by Gant, there is sufficient inspiration in this chapter to cause all to avoid the pitfalls of routinism.

The principal chapters deal with anesthesia, malformations, inflammatory diseases and injuries of the anus and rectum. They are very good. The chapters on hemorrhoids are splendid and only one criticism seems justified. The author condemns the injection treatment with carbolic acid in no uncertain terms and even cites deaths that have resulted from this crude procedure, and then weakens this dictum by the following unfortunate phrase: "The author prefers the following formula made fresh for each treatment," thereby implying that he actually uses a solution of equal parts of liquefied phenol, glycerine and distilled water for purpose of injection into "selected" hemorrhoids.

The illustrations depicting the various methods of treatment of all varieties of hemorrhoids are unusually good, and demonstrate the technics step by step.

The second volume takes up hemorrhage, prolapse, pruritus, tuberculosis, venereal diseases, strictures, tumors, diverticula and malignant growths, to which last subject the author devotes no less than eight chapters.

About one-third of the volume is devoted to the anatomy and physiology of the intestinal canal and to diseases of the colon.

This volume is dignified and scholarly. There is a visible systematic effort to avoid elementary discussion and burdening the text with unnecessary details. The chapters dealing with the radical operations for malignancy are superb and the illustrations can, without exaggeration, be designated as artistically beautiful and scientifically the acme of perfection.

The third volume is characteristic of the author's personality in that while dealing with colonic and intestinal diseases, Gant has known how to avoid duplication of matter which can be found in standard surgical treatises. While the diverse surgical procedures, physical and pharmocologic remedial agents for this class of diseases render some duplication unavoid-

able, this has been accomplished in as brief a manner as possible, occasionally, we fear, somewhat too briefly. Thus the subject of autointoxication of intestinal origin is barely touched, when in a book of this character and size it could have been treated with greater detail to advantage, particularly so because just now many clinicians seem averse to recognize autointoxication even as a symptom-complex.

The chapters on constipation, obstipation and intestinal stasis are treated exhaustively and leave nothing to be desired.

On the whole, all that has been said regarding the second volume applies also to the third volume.

Taken all in all, we have before us a masterpiece of which the profession of America can well be proud.

No general surgeon and no general practitioner can afford to ignore the wealth of information contained in this pretentious, yet simply written, work.

G. M. Blech.

The Reduction of Domestic Flies, by Edward Halford Ross, M.R.C.S. (England), L.R.C.P. (London), of the John Howard McFadden Researches, the Lister Institute of Preventive Medicine, London; late of the Liverpool School of Tropical Medicine; and sometime Health Officer, Port Said, the Suez Canal District, and Cairo. Philadelphia: J. B. Lippincott Company, and John Murray, London.

The author states that the object of this book is to bring to public notice the necessity for the reduction of domestic house flies in cities, towns, villages and rural districts.

The entire life history of the house fly is described clearly and in detail. This is followed by a description of the life and habits of the adult fly.

Destructive measures are discussed at considerable length and include the management of anti-fly campaigns and the publicity connected with them.

The author truly points out that it takes more than legal establishment of public health measures to secure results in any community. If the weight of public opinion is behind these measures, however, they will be found to be far-reaching and more readily enforced.

George F. Lull.

Obituary

RESOLUTIONS

At a meeting of the Executive Council of The Association, held on September 6, the following resolutions were adopted:

Whereas, Untimely death has removed from our circle Colonel James Robb Church, Secretary-Treasurer of The Association of Military Surgeons of the United States, Editor of THE MILITARY SURGEON, a man widely known throughout the medico-military profession, universally beloved by his associates of all ages, and upon whom high honors had been bestowed in the course of his career; therefore, be it

Resolved, That on behalf of all members of The Association of Military Surgeons of the United States, the Executive Council thereof offer this final tribute of homage and affection to the memory of Colonel Church, expressing at the same time a full measure of sorrow for the loss of their personal friend and companion; and be it further

Resolved, That the Executive Council extend to the family of Colonel Church their profound sympathy in the face of this, their bereavement, with the hope that contemplation of his virtues and of the esteem in which he was held among men may serve to lighten, in such measure as may be possible, the burden of their grief.

EDGAR ERSKINE HUME,
Major, Med. Corps, U. S. A.,
Secretary.

CHARLES LYNCH,
Colonel, Med. Corps, U. S. A.,
President.

The following is a list of our members whose deaths have been noted since our last report:

Lieut. Col. Harold Barclay, M. C., U. S. Army
First Lieut. Phil B. Brooks, M. R. C., U. S. Army
Major Jos. R. Culkin, M. C., U. S. Army
Col. James Robb Church, U. S. Army, Ret.
Capt. Alex. R. Craig, M. R. C., U. S. Army

Capt. Robert M. Funkhouser, M. R. C., U. S. Army
First Lieut. Michael H. Gleason, M. C., U. S. Army
Maj. John J. Goodwill, M. R. C., U. S. Army
First Lieut. Homer B. Haile, M. R. C., U. S. Army
Capt. John L. Ireland, M. C., U. S. Army
Major Wm. S. Lawrence, M. C., U. S. Army
Major Guthrie McConnell, M. R. C., U. S. Army
Major Percy Musgrave, M. R. C., U. S. Army
A. A. Surg. Henri L. Pache, U. S. P. H. S.
Major A. D. Parce, M. C., U. S. Army
Capt. Geo. W. Pattison, M. C., N. Y. N. G.
Lieut. Col. C. E. Sutphen, M. R. C., U. S. Army
Major Herman Tuholske, M. C., Mo. N. G.

Died at Fort Sam Houston, Texas, June 7, 1923, Capt. Francis A. Halliday, U. S. Army, Retired. Enlisted as Hospital Steward, 9th Illinois Cavalry, September 10, 1861; discharged September 23, 1864; commissioned First Lieutenant, 9th Illinois Cavalry, January 31, 1865.

Served throughout the Civil War, in Indian Campaigns and the Spanish-American War, retired September 13, 1908.

Memberships.—Original Companion of the First Class of the Order, Military Order of the Loyal Legion of the U. S.; Military Surgeons; Odd Fellow of Illinois; York Rite Mason, of Illinois; Omar Temple of A. A. O. N. M. S. of Charleston, S. C.; Member of Grand Lodge of Illinois, 1878.

THE
MILITARY SURGEON

VOL. 53 NOVEMBER, 1923 NUMBER 5

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE BENEFITS DERIVED BY MILITARY MEDICAL SCIENCE FROM ANIMAL EXPERIMENTATION

BY LIEUT. COLONEL EDWARD B. VEDDER
Medical Corps, United States Army

THE WELLCOME FIRST PRIZE ESSAY, 1923

TO A CONSIDERABLE extent an essay on this subject in THE MILITARY SURGEON is "carrying coals to Newcastle." There are many people who might learn profitably that the progress of medical science has been and will be largely dependent upon animal experimentation; but the military surgeon, like any other well-educated physician, does not require to be told this. There are reasons, though, why such an exposition may not be entirely a work of supererogation.

We have all been astonished at the persistence of the attacks of antivivisectionists. This wonder ceases when we learn that the American Antivivisection Society is a well-endowed institution, and by virtue of this endowment is just as certain to continue its propaganda as any endowed university or other institution of learning is to continue its teaching. The funds constituting this endowment have been contributed for this purpose alone, and so far as we know may exist in perpetuity.

The great majority of people are more or less thoughtless concerning matters that do not pertain directly to their business of securing their daily bread and the butter that should go with it. Prayer alone will not secure even the daily bread, and it is certain that they are obliged to arise early and work late for the butter. In this state of affairs, the average man becomes very open to suggestion, and he receives ideas as vital to his existence as his religion or his politics largely on suggestion rather than on reasoned consideration. He has no time to verify the statements which he reads

or hears. Moreover, according to the results obtained in the army psychological tests, it appears that at least 67 per cent of the population (graded from C to D−) are rather deficient in reasoning powers.

For these reasons, which appear perfectly good and sufficient, there have always been leaders whom the majority follow. In this case, the antivivisectionists, by divine right of endowment, have elected themselves to be our leaders. And remembering that a departing congressman recently solemnly warned us of what we already suspected, namely, that our government at present is conducted by organized minorities, it is about time that we did a little leading ourselves if we do not want to find ourselves hampered like our British confreres, when they wish to do a bit of research work involving animal experimentation. Shall we let the blind lead the blind? If not, it will be the duty of every physician, military or otherwise, to inform himself concerning chapter and verse of the development of the science of medicine, and to show how far it has developed as the result of animal experimentation. It will be his further duty to explain this fact to his patients, friends and acquaintances whenever a proper occasion presents itself. Only in this way can the propaganda of the antivivisectionists be combated. We may rely on the common sense of the average man if we will give him the facts, even though he may not be graded as "very superior" by psychological tests.

We may say roughly that there are only two methods whereby we may learn anything concerning the diseases to which flesh is heir and the manner of treating them. These are observation and experimentation. It is possible to learn a very great deal by observation alone. It was solely through the acute observation of great clinicians that many of our diseases were identified by their symptoms. Thus smallpox, scarlet fever and measles were separated and identified, and typhoid was recognized as a specific disease and separated from typhus, with which it was earlier confused. Many other similar instances could be quoted to illustrate the wealth of information that is the result of trained observation. But all treatment is a matter of experimentation. There was only one way of learning whether a given drug would cure a disease, and that was by giving it a trial. Every priest, medicine man, or doctor who treated disease, from the most remote antiquity until the dawn of modern scientific medicine, experimented in just this way, on man. And much was learned in this manner. The use of two specifics, Peruvian bark and mercury, as well as the properties

of opium and many other useful drugs, were thus ascertained after centuries of painful experimentation on human subjects. As Mark Twain says, it is a wonder some one did not think to "try it on a dog or a plumber first."

Again, the relation existing between cause and effect can seldom be ascertained save by experimentation. Hence, though diseases could be identified and named by observation, little has been learned concerning the origin or causation of these diseases except by experiment. Here again much has been learned by experimentation on man. Thus, Jenner learned how smallpox might be prevented by vaccinating human subjects with cowpox, and Reed demonstrated by experiments on man that yellow fever was transmitted by the bite of an infected Stegomyia calopus or Aedes calopus, or whatever name has been finally assigned to this insect. But in this latter case, at least, Reed could hardly have been successful had he not had the basis of much experimental work on animals to proceed upon.

But, though experiments on man are certainly animal experiments in the broad sense of the word, it is apparent from the title of this essay that we are to discuss experiments upon animals other than man. (Curiously enough, the antivivisectionists seldom object to experiments on man, and in certain instances actually recommend them in preference to experiments on animals.[1]) Also that we are to discuss them in their relation to *military* medical science.

Now, the military surgeon practices internal medicine and surgery very much as do other physicians. The principles of medicine and surgery are ever the same. When the practice of military medicine or surgery departs from that of our civil confreres it is merely in adapting these principles to the difficulties and straightened circumstances of the campaign, or to the exigencies of the military service. In addition to all this the military surgeon must be a practical sanitarian. His strictly military functions have no bearing on the present discussion. We shall, therefore, discuss the development of medicine, surgery and sanitation with regard to the principal advances that have been made as the result of

[1] Senator Norris: I take it that you want to prevent experiments on anything and everything?

Senator Ashurst: Except man.

Mr. Hutchins: Yes; I think if men want to experiment in vivisection, they should vivisect each other.

Testimony of Mr. Walter S. Hutchins, former president of the Washington Humane Society, on Bill prohibiting experiments upon living dogs, S.1258, Government Printing Office, 1919, page 32.

This is a case where the argument may safely be left to the lay mind; for surely few persons having intelligence above the grade of idiot would prefer to be the subject of experiments which could be performed on animals as readily.

animal experimentation. It is evident that it will be difficult, if not impossible, to compress all this within the scope of a readable essay.

Hippocratic medicine was founded on observation, and there is no record of animal experimentation, and as a result medical science was very limited. The dominating theory of disease was humoral. According to this theory, the body contains four humors, blood, phlegm, yellow bile and black bile. A right proportion of these mixtures constitutes health, and improper proportions or irregular distribution causes disease. There was little anatomy and no physiology or pathology. Nothing was known of the blood vessel system or the circulation of the blood, but in slaughtered animals the pulsation of the aorta and other vessels had been observed.

After Hippocrates, Galen, about A. D. 150, established the next landmark in medical science. This was not the result of accident, for it is a peculiar coincidence that Galen performed some of the first animal experiments of which we have any record. Until the time of Galen it had been supposed that blood was contained in the veins while the arteries were supposed to contain air, and to this belief they owe the name.

Galen quotes two experiments in proof of the fact that the arteries contain blood:

1. "Expose an artery of a living animal. Then open it by applying to it, as you choose, either the point of a writing style, a needle, a slender scalpel, or any similar instrument that will make a narrow cut. Blood will at once exude. The artery, then, must have contained blood and not air." (Pneuma.)
2. "The artery of a living animal is exposed by dissection; and after isolating it with a cord on two sides and then opening it in the middle, we showed it to be full of blood."

Thus we see that the only positive advance in physiology at this time was due directly to animal experimentation. For the rest Galen's physiology was modeled on the Hippocratic theory of humors, which he developed with fatal ingenuity. According to Galen the normal condition of the body depended upon a proper mixture of four elements—hot, cold, wet and dry. From faulty mixtures of the same arose distempers which, if not actually disease, yet were the occasions of disease.

No animal experiments were performed between the time of Galen and Vesalius (1514–64), and medicine during this period became simply a slavish worship of Galen. The works of Galen

were quoted with as firm a belief in their authority as is displayed today by a theologian who quotes the Bible in the belief that the book is the literal and verbal inspiration of the Deity. As a result of this blind adherence to authority, the science of medicine failed to make any progress, and physicians were, generally speaking, held in low esteem. An illustration of the state of medicine during this long period may be drawn from Conan Doyle's "White Company." Although this is a popular novel, its medical author has given a very interesting picture of the state of civilization in 1350 A. D.

"A raw rat," the man of drugs was saying, "is what it is ever my use to order for the plague—a raw rat with its paunch cut open."

"Might it not be broiled, most learned sir?" asked the tooth-drawer. "A raw rat sounds a most sorry and cheerless dish."

"Not to be eaten," cried the physician, in high disdain. "Why should any man eat such a thing? It is to be placed on the sore or swelling. For the rat, mark you, being a foul-living creature, hath a natural drawing or affinity for all foul things, so that the noxious humors pass from the man into the unclean beast."

Defoe's "Journal of the Plague Year," though written in 1722, is an accurate portrayal of the horrors of the epidemic of bubonic plague that swept England in 1665 and of the helplessness of medicine at that time. Surely it is not too much to ask any anti-vivisectionist to read this book, and remember that it is solely due to animal experimentation that we have learned that plague is communicated from infected rats to man by the agency of the rat flea, and that it is solely because of this information that we are now enabled to bar plague from countries like England and the United States and to prevent the development of devastating epidemics like that described by Defoe.

But we digress, and must return to Vesalius, who revived that sleeping beauty, medicine, after a slumber of 1300 years. In all these years, Vesalius appears to have been the first man who preferred to ascertain the facts from his own observations and experiments, rather than to accept them on the authority of Galen. Vesalius, by his dissections, which he pursued in spite of tremendous difficulties, became the first real anatomist and thus made the study of physiology possible. Not content with this, he performed numerous vivisections and contributed much to physiology. Among other things he showed that the pulse is not dependent upon the uninterrupted connection of the walls of the arteries with

the heart, as Galen had maintained, because the peripheral part of a severed artery continued to beat when connected with the heart by a cannula.

Another 200 years then elapsed with little further progress, and that little owing to animal experimentation. As Servetus said during this period, "One learns more in a day from the vivisection of a dog, than from feeling the pulse or from reading Galen for months." Then, at about A. D. 1600, Harvey commenced his work. The discovery of the circulation of the blood was the result of no happy accident or chance.

As Harvey himself says: "When I first gave my mind to vivisections as a means of discovering the motions and uses of the heart, and sought to discover these from actual inspection, and not from the writings of others, I found the task so truly arduous, so full of difficulties, that I was almost tempted to think with Fracastorius that the motion of the heart was only to be comprehended by God. At length, and by using greater and daily diligence and investigation, making frequent inspection of many and various animals, and collating numerous observations, I thought that I had attained to the truth, and that I had discovered what I so much desired, both the motion and the use of the heart and arteries. From that time I have not hesitated to expose my views on these subjects."

Now, the great work that Harvey accomplished by means of these animal experiments, may be faintly comprehended if we recollect that, previous to his work, the idea that the blood circulated had not even occurred to anyone.

The movements of the heart were indeed vaguely connected with the passage of blood to the lungs. But not all of the blood went to the lungs; most remained in the venous system and the right ventricle. A portion, as Galen taught, found its way through pores or foramina in the septum of the heart from the right to the left side. But apart from this there were two practically separate kinds of blood, one in the arterial system and the other in the venous system. The blood was not motionless in these vessels, but moved up and down as by an ebbing and flowing tide, particularly in the veins, which were believed to originate chiefly in the liver. The heart was known to beat, but its beat effected nothing; its pumping function was not even guessed at. The function of the pulmonary artery was simply to nourish the lungs.

Now note the result of observation of the living animal. Harvey tied the aorta at the base of the heart, and opened the carotids. They were empty, although the veins were full. The arteries,

therefore, receive no blood except by transmission through the heart. Every time the heart contracts, the pulse is felt. With each contraction of the left ventricle the blood is thrown into the arterial system, and as the contractions are so frequent, a large quantity of blood is passed on in a short space of time. The arteries, strong as they are, would burst if the pressure were not relieved. Where does the blood go? Harvey observed the veins bringing blood into the heart. The veins would soon be drained by the blood going from them so quickly into the arteries, yet the valves in the veins prevent flow except toward the heart. Harvey found evidence in this and from similar observations and experiments of a regulated continuous flow, with the heart as the propelling engine. But why two sides to the heart, and why does a great artery go to the lungs? Surely so much blood is not required merely to nourish these organs. Finally he understands. The right ventricle is for the pulmonary circulation and the left for the general circulation. These are very briefly some of the arguments and observations leading to the great discovery. Incidentally it may be noted that although Harvey spoke of the circulation of the blood in his first course of lectures on Anatomy and Surgery at the College of Physicians in 1616, thereby causing great astonishment at these novel views, it was only in 1628, after many additional experiments, that he published his treatise "On the Motion of the Heart and Blood in Animals." Every physician should at least glance through this book and observe the process by which so great a discovery was made.

I have dwelt at considerable length on this discovery of the circulation of the blood, but it is fundamental for our purpose. It shows that it required 1600 years of the Christian era, not to mention the countless centuries before that, to learn what every school boy now knows; that this information in the nature of the case could only be obtained by observation of the living animal, i.e., by vivisection; and that if this information had not been thus obtained we would have been absolutely ignorant of physiology. For what ideas could we have had of secretion, digestion, excretion, respiration, or any vital function, without the fundamental fact of the circulation? Without physiology how could we have had any ideas as to the altered function or pathology of disease? What ideas could we possibly have had of pharmacology or the mechanism of drug action? How little can we now recognize in modern scientific medicine that does not rest absolutely on this single cardinal discovery!

The antivivisectionists often claim that nothing of value has been or can be learned from vivisection. For a complete refutation of this argument it would be sufficient to cite this single discovery upon which all modern medicine is based. But all that we have since learned concerning the circulation is similarly owing to animal experiment. How were the vaso motor nerves discovered which control automatically the distribution of blood in the body? Claude Bernard discovered them in 1851 by cutting the sympathetic nerve in the neck of a rabbit. The vaso motor nerves are mixed with other nerves. The drug curare, it was found, blocks the passage of impulses to the skeletal muscles, and then stimulation of the nerve affects the blood vessels alone. Few people had heard of blood pressure twenty years ago, yet now it is a matter of common conversation and acute interest. Instead of asking, "How do you do?" on greeting a person, we might well ask, "How is your blood pressure?" The fact that blood pressure existed was learned by putting a cannula in the artery of a dog and connecting it with a mercury manometer. After the details concerning the blood pressure in the dog were thus learned, it was found that the blood pressure could be recorded by placing a pneumatic band around a limb of the dog. But it became necessary to standardize this method, so a cannula was placed in the artery of one leg, and the pneumatic band was placed about the other leg of the same dog. The cuff apparatus could then be adjusted so that it would give the same reading as the manometer connected directly with the artery. This was finally carried over to man by observation on a patient who was to have a leg amputated. With the permission of the patient, the cuff apparatus on the sound leg was standardized with the direct arterial pressure of the leg that was to be removed. It is difficult to see how we would ever have learned anything concerning the measurement of blood pressure without these experiments on animals.

The electrocardiograph is an apparatus that gives us an accurate picture of everything that happens during the cardiac cycle. As the heart contracts an electric current is generated which can be measured by attaching the wires of a very sensitive galvanometer to one arm and one foot, or even to both hands. We could never have learned what these electric currents meant, if the apparatus had not first been tested on the hearts of dogs which had been exposed after anaesthetization. It was thus found that a normal heart beat produced a certain cycle, which was altered in various specific manners corresponding to certain injuries to the heart.

The electrocardiograph which is now extensively used in the diagnosis of heart disease would probably not have been discovered without animal experimentation and certainly could never have been interpreted without long and patient observation of the correlation between heart injury and the corresponding electrocardiograph in animals.

Next to the circulation of the blood, an understanding of the mechanism of respiration is of prime importance to a proper interpretation of physiological phenomena. Galen observed that air was necessary both for combustion and for life, and stated his belief that the explanation of the first would provide an explanation of the other. But here again it required over 1,600 years to arrive at a correct solution. During this time respiration was very generally regarded as a process for cooling the excessive heat of the heart. This view became untenable after Harvey had described the pulmonary circulation, and in 1660 Robert Boyle using his newly discovered air pump found that flame was extinguished, and animals died in a vacuum. A mouse or a sparrow placed in the receiver of the air pump died when the air was exhausted. This experiment, which was fundamental to an understanding of respiration, depended upon the use of living animals. It showed that air and not merely the motion of the chest was the essential of respiration and also that whatever the change was which was effected by breathing, it was similar to or identical with the change going on in the burning of a candle.

Hooke made the next important contribution in 1667. Having widely opened the thorax of a dog he showed that the animal could be kept alive by artificial respiration with a bellows in the absence of all movement of the chest wall. He further showed that the animal could equally be kept alive without any movement of the lung. He kept the lung motionless, but distended by a powerful blast of the bellows allowing this air to escape continually through small holes pricked in the lungs. This proved that the movement of the chest and lungs was merely incidental and that the essential factor in respiration was a supply of fresh air in order to bring about the change in the blood passing through the lung as a result of which it became arterial blood capable of nourishing the body.

Mayow demonstrated by animal experiment about 1668 that it was not the whole air that was necessary for respiration, but only a particular part of the air. He observed that when a candle is burned in a closed vessel over water, the water rose in the vessel, and that exactly the same thing occurred if the air were breathed.

When a mouse was put inside a cupping glass with a wet bladder stretched over its wide mouth and allowed to remain until it died for lack of air, the bladder bulged up into the cupping glass. He says, "I have found, by experimenting with various animals, that air of a closed vessel in which the animal is allowed to remain until it dies for want of air, is by the breathing of animals reduced in volume by about one-fourteenth."[2]

No further explanation of respiration could be made until the chemical constitution of air was determined. Black discovered carbon dioxide in 1757, and nitrogen was first described by Rutherford in 1772. Oxygen was prepared by Priestly in 1774 and was identified by Lavoisier in 1775. Hydrogen was described by Cavendish in 1781. To Lavoisier belongs the great credit of explaining combustion as oxidation with the evolution of carbon dioxide and water, and of demonstrating that in respiration precisely the same chemical process occurs. Thus we see plainly, that although the latter step of this advance was owing to the development of the science of chemistry, the application of these chemical observations to the phenomenon of respiration was made possible solely by the animal experimentation of Boyle, Hooke and Mayow.

In like manner the processes of digestion were a complete mystery until animal experiments were performed. Wirsung discovered the pancreatic duct in 1642, and deGraff in 1664 first obtained pancreatic juice, which was the first digestive fluid to be studied. He opened the abdomen of a fasting dog, ligatured the duodenum above and below the entrance of the duct. Then opening the duodenum and sponging it off, he introduced the quill of a wild duck into the mouth of the duct. He was thus enabled to collect on several occasions from two drachms to an ounce of pancreatic juice. By the same method he later obtained saliva from the parotid duct and bile from the bile duct.

In 1666 Malpighi proved that bile was secreted by the liver and not by the gall bladder as was believed by many. Laying open a kitten, he tied the common bile duct close to its entrance into the duodenum, and emptied the gall bladder by a median incision. In a short time the bile ducts were filled with bile. He then tied the neck of the gall bladder, and found the common duct and the bile duct still full of bile. Nor could the bile be expressed back to the liver with the finger, but returned at once as soon as the finger was removed. Since that time it has been known that bile is the secretion of the liver.

---

[2] Foster, Lectures on the History of Physiology, Cambridge University Press, 1901, page 192.

The next important step in the study of the digestive process was made in 1752 by Reaumur, when he developed a method of investigating the process of gastric digestion in the living animal. He used metal tubes closed at both ends with a wire grating. He filled these tubes with meat, grain, bone, and other foods and gave them to birds, dogs, sheep and other animals. In some of these experiments he withdrew the tubes after a certain period and observed how far the food was altered by the gastric secretion. In other cases the animal was killed and the tube removed from the stomach. He found that meat and bone were dissolved in the stomach of carnivorous animals, while vegetable grains or flour were little altered, and that chopped hay was digested in the stomach of the herbivora. He also obtained a small sample of gastric juice by filling his tubes with pieces of sponge and squeezing out the fluid which they had imbibed after they were recovered. In this way he secured several ounces of an opalescent fluid "which turned blue paper red," and first investigated digestion *in vitro* with this fluid.

Spallanzani continued to use Reaumur's method and published his observations on digestion in 1777. He found that large particles were dissolved much more slowly than small ones, and thus discovered the value of mastication as a preparation for the process of gastric digestion. Finding that digestion *in vitro* was much slower than in the stomach he imitated the natural process by permitting the gastric juice to fall drop by drop upon the pieces of meat. He now found that "solution took place with exceeding speed."

It would take far too long to follow the development of our knowledge of the process of digestion further, and it is sufficient for our present purpose to have shown how the first principles were established, and that the first knowledge of all the important digestive secretions was gained by animal experimentation. It could obviously be acquired in no other way. And further advances in knowledge of digestion were obtained by similar methods.

Our information on the action of the nervous system was obtained by the same maligned vivisections. Vesalius showed that by ligaturing or cutting a nerve the function of the muscle supplied was abolished, and demonstrated clearly that the contraction of the muscle was dependent upon its nerve. Further that if the spinal cord were severed, all parts supplied with nerves below the section will be deprived of sensation and movement. Also that when the brain was removed, sensation and movement are lost.

It was not until the nineteenth century that Bell and Majendie demonstrated the fundamental distinction between sensory and motor fibres. Is it possible to conceive how this information could be secured except by experiments on the living animal? In 1851 Claude Bernard discovered that when the sympathetic nerve in the neck of a rabbit is cut, the blood vessels in the ear of the same side became greatly dilated. When the peripheral end of the severed nerve was stimulated, the ear became blanched, owing to a constriction of the blood vessels. Thus the existence of vaso-constrictor fibres to the blood vessels was demonstrated, and their distribution was studied by means of the drug curare already mentioned.

Our present knowledge of cerebral localization of function has been chiefly derived from animal experimentation. Indeed there are practically only two methods of obtaining this information. First by observing the effects of stimulation by electricity or other methods of various parts of the brain, or by studying the defects produced by destruction or removal of portions of the brain. The second method consists in observing the disturbances of body and mind occurring as the result of disease or injury in man, and subsequently learning the extent and localization of the disease or injury by post mortem examination. Since such cases are comparatively rare and the ability to study a particular area of the brain would depend purely on a fortunate chance, an investigator might well spend his life awaiting such a patient in vain. Whereas he can make the experiment at will upon an animal. The rapid development of our accurate and comprehensive knowledge of cerebral localization could have been brought about only through the extensive use of animal experimentation. The results of this work have been of great value not only to a proper understanding of physiology, but in the diagnosis of disease and injury to the brain, and it has made the recent development in brain surgery possible. Surgeons now locate tumors in the brain with precision, and operate for their removal with a nonchalance that would have proved amazing to surgeons of a century ago. And in spite of these facts, opponents of vivisection challenge us to cite any instance where animal experiments have been of benefit to man.

Lest it may appear that this essay will meander through the entire history of physiology, it may be well to announce to the readers, if any, who have followed thus far, that one more instance taken from physiology positively must suffice. I cannot leave the subject without at least outlining the process whereby we acquired

our information concerning the internal secretions of the ductless glands.

The thymus, thyroid and suprarenal glands were recognized more than four hundred years ago, or since the time of Vesalius; but our knowledge of their function originated about forty years ago. Schiff had found as early as 1858 that complete removal of the thyroids caused the death of the animal, but this gave no clue to the cause of death. In 1873 Gull reported five cases of what we now call myxoedema, and in 1878 Ord reported a similar case that was examined post-mortem. It was noted that the thyroid glands were atrophied. In 1883 Kocher, who had been removing goiters, reported on the after effects of this operation, describing these effects by the name cachexia strumipriva. Schiff now repeated his work and found that when the thyroids were removed the animal died with the same symptoms that Kocher had described in human beings after removal of the thyroid because of goiter. It was also found by post-mortem examination, that the thyroid glands of cretins were also atrophied. Schiff in 1884 transplated one thyroid into the peritoneal cavity of the same animal, and removed the other entirely. The animal survived, which demonstrated that death after complete removal of the thyroids is due to something supplied by the gland and not to the operation itself. These facts proved that the thyroid glands supplied something essential to the health and life of both man and animals. As a result of the latter experiment an attempt was made to cure cases of myxoedema by grafting pieces of thyroid gland removed at operations into the peritoneal cavity or subcutaneous tissues of patients suffering with myxoedema. This method relieved the symptoms, but the relief was not permanent because the grafted thyroid tissue subsequently atrophied or became absorbed. Then it was found in 1891 that such patients could be relieved by injections of extracts prepared from the thyroid glands of animals, and a little later that similar results could be secured by feeding these glands. It is thus apparent that in forty years we have learned more by experimentation than in the previous four hundred years. It was established that the internal secretion of the thyroid was essential to life; that its absence produces myxoedema in adults and cretinism in children; that these conditions can be cured by the administration of thyroid extract obtained from the glands of slaughtered animals; and that in operating for goiter, it is necessary to leave part of the thyroid gland to prevent the subsequent development of myxoedema or tetany. Still later it was learned that exophthalmic goiter is

caused by hypersecretion or hyperthyroidism, and Kendall has within the last five years succeeded in isolating the active principle of the thyroid secretion and in preparing it synthetically.

Moreover, this work on the thyroid merely served as the thin edge of the wedge upon research on the function of the ductless glands. In 1880 the parathyroid glands were discovered, and by a series of experiments it was determined that the tetany developing after complete removal of the thyroids was in reality caused by the removal of the parathyroid grandules which are practically embedded in the thyroid glands. As a result of this finding, surgeons now exert great care to leave these small glands when removing the thyroid, and tetany no longer follows such operations.

In 1855 Addison described a disease now called Addison's disease, and post-mortem examination showed that the suprarenal glands were diseased. In 1856 Brown-Sequard found that the removal of both suprarenal glands caused the death of the animal. Many experiments were then performed attempting to save animals whose suprarenals were removed by injecting extracts of these glands. None of these experiments have been successful, and no complete extract of the suprarenal glands, possessing the full physiologic action of these glands, has ever been prepared. But as the result of these experiments a partial extract, known as adrenalin was prepared. Adrenalin is a very potent drug used for checking certain kinds of haemorrhage, and as a vaso motor and cardiac stimulant. It is widely used in medicine and surgery and we owe all our knowledge of it to animal experimentation.

In 1886 Marie described acromegaly and this curious disease was found to be associated with tumors of the hypophysis or pituitary, a small gland at the base of the brain. Little more was learned about this gland until 1907 when Paulesco developed a method of operating upon it through the temporal bone. It was then found experimentally that complete removal of the hypophysis causes the death of the animal within two days, but if a portion be left, the animal will live. This showed that the pituitary gland also produces an internal secretion indispensable to life. Here again it is as yet impossible to prepare an extract having all the physiological properties of the gland, for animals cannot yet be saved by such extracts after the pituitary has been completely removed. But the extract prepared from the posterior portion of this gland causes powerful contractions of the uterus and has come into very general use in obstetrical practice where it is used to assist a weak or relaxed uterus to expel its contents.

Similarly as the result of animal experimentation we are learning new facts rapidly concerning the internal secretions of the testicle and ovary. One new therapeutic agent, the extract of corpus luteum has been introduced already as the result of these experiments.

The isolation by Banting and his co-workers of an active glycolytic pancreatic extract called insulin is a great advance in the treatment of diabetes mellitus. Little was known concerning the cause of diabetes mellitus until 1889 when Von Mering and Minkowski discovered that the removal of the pancreas from dogs resulted in a fatal diabetes. The ligation of the pancreatic duct did not produce diabetes, nor did removal of a small portion of the pancreas. Further it was found that diabetes did not occur if the pancreas which had been removed was transplanted. These experimental facts indicated that the pancreas furnishes an internal secretion without which diabetes developed. It had been observed at the post-mortem examination of diabetics that the islands of Langerhans were degenerated, and it was naturally concluded that the internal secretion of the pancreas was the function of the glandular structure that composes these islets. Many investigators attempted to prepare extracts of the pancreas which would possess the glycolytic function of this internal secretion, but these attempts were unsuccessful until May, 1922, when Banting used a new method. The pancreatic ducts were ligated. This resulted in a degeneration of the glandular tissue of the pancreas concerned in producing the external digestive secretion, the pancreatic juice, but did not cause degeneration of the islands of Langerhans. A number of dogs were so treated, then after an interval of ten weeks, during which the pancreas degenerated until only the islets remained, the pancreas was removed from these dogs and extracted with ice cold Ringers solution. After this extract had been filtered and otherwise purified, it was injected intravenously into a dog made completely diabetic by total extirpation of the pancreas. Such completely diabetic dogs generally live only about fourteen days, but by the injection of this extract of the islands of Langerhans or insulin, the dog lived 70 days. Many other experiments were necessary to further improve the preparation of this extract. The end result of this series of experiments on a few dogs and rabbits is that the diabetic patients of all time to come will receive the benefits of this treatment. Several hundred diabetics are already under this treatment which provides great relief in practically all cases and is actually life-saving in many cases.

Let us now pass to a brief consideration of the closely related subject, pharmacology. Pharmacology is the study of the physiological action of drugs. It is a comparatively recent science because such study was impossible before the development of normal physiology which we have just outlined. Like physiology it is likewise based on animal experimentation. Although several notable advances in therapeutics were made as the result of human experimentation in the course of the centuries preceding the development of physiology, even such knowledge was empiric. Nothing was known concerning the mode of action of drugs. We have learned more concerning the action of drugs in the past fifty years by animal experimentation, than was learned during all previous time. There are several reasons why human drug experimentation was relatively unsuccessful. When we give a man a drug, we may observe whether his condition is improved, but we learn nothing concerning the physiologic action of the drug by which this improvement was brought about. Again, there are as yet few specifics, and most drugs are used to alleviate certain conditions. When a certain drug was given a patient it was difficult to decide whether the patient recovered because of or in spite of the medicine. It was always a question whether it was *post hoc* or *propter hoc*. So that every drug had to be tested upon a large series of cases in order to learn what could easily be learned by a single experiment upon an animal where all the conditions and circumstances could be rigidly controlled.

No treatment was too silly or harmful to find devoted adherents among physicians whose only source of knowledge was human experimentation or as it is usually called, empiricism.

Thus before the development of pharmacology, purging and bleeding were held to be sovereign remedies for any and all diseases. I have read the statement, made quite seriously, that it was useless to give less than eighty grains of calomel, if any beneficent action was to be expected. Dr. Sangredo, so aptly depicted in Gil Blas, was by no means an exceptional type. Many prescriptions called for the administration of toads, dung and other loathsome ingredients. It was entirely due to such errors in the practice of medicine that Homeopathy was able to raise its head. The Homeopath of those days at least permitted his patient to recover without purging, bleeding and nauseous boluses. The more graphically we describe the art of medicine before the days of animal experimentation, the more disgusted we become.

Let us now take several classes of drugs in common use today.

The sleep-producing action of every one of the soporifics was determined first by animal experimentation before they were used on man. The anthelmintics such as santonin, thymol, chenopodium, carbon tetrachloride were all either discovered or their application learned through tests on animals. Thymol is a very depressing drug and when first used to expel hookworms it was followed by alcohol in order to overcome this depression. The edition of Osler's "Practice of Medicine" which I used as a student recommended that thymol be given with brandy and followed by castor oil. The death rate under this treatment was 7 per cent. Experiments on dogs were undertaken to discover the cause of this mortality. Briefly it was demonstrated that when alcohol was not administered and some other purgative than castor oil was used, the treatment was perfectly safe. Thymol is soluble in alcohol and in oils, which thus increased its toxic action. It might be supposed that this thought should have occurred to physicians administering the drug. But it did not, and the fact was learned through animal experimentation. The action of digitalis or strophanthus in organic heart disease is a most striking instance of the ability of drugs to actually save life. As the action of the heart itself was learned through vivisection, so was the action of these drugs. The same may be said for amyl nitrite. We have already referred to the development of the products of the ductless glands, thyroid extract, adrenalin, and pituitrin as the direct result of animal experimentation. It must now be noted that not only were such substances so discovered, but that they and other drugs must be standardized by their effect on animals. Pituitrin is used in obstetrics to stimulate the uterus to contract and expel its contents. Pituitrin is made from the pituitary glands removed from slaughtered animals. No two preparations will be of precisely the same potency. Ergot is likewise used in obstetrical practice chiefly to control haemorrhage. Ergot is an extract of a fungus, the claviceps purpurea. As the active principle varies in each lot of this fungus, it is impossible to prepare a standardized extract. Each lot of pituitrin is therefore standardized by its action on the uterus of the guinea pig. Each lot of ergot by its action upon the comb of a rooster. The blood vessels contract and the comb turns pale, and the power of that extract to check haemorrhage may be gauged by the intensity of this vaso motor phenomenon in the comb of the rooster. Let us imagine a woman in labor, perhaps the wife or daughter of an antivivisectionist. Would he prefer that the doctor should use an untested and perhaps quite unreliable preparation, or that he

should use a drug that had been standardized by animal experimentation, so that its potency was assured and its exact power known. Here again is one of those questions concerning whose answer most people will unhesitatingly agree. Each lot of adrenalin which is also used at times for checking certain kinds of haemorrhage, and each lot of digitalis must be similarly standardized by their action on animals.

I would like, in closing the argument concerning the benefits derived by pharmacology from animal experimentation, to mention a very important advance published in a recent article.[3] This indicates that Tryparsamide has an exceedingly favorable effect on cases of paresis, a disease which is really syphilis of the brain, but for which, as is well known, we have no remedy. Both arsphenamin and mercury, although they are specifics for syphilis, fail to penetrate the central nervous system. As a result of treatment with Tryparsamide, the authors report that of forty-four patients in an advanced stage of paresis, twenty-one had been discharged from the hospital and were actually earning their living. Of twelve other cases not so advanced, seven recovered mentally and were earning their living, and the remaining five had recovered mentally but had not yet been discharged. Tryparsamide is a synthetic arsenical first prepared by Jacobs and Heidelberger in 1915, and it was subjected to a long study by Brown and Pearce,[4] to determine its biological properties. For this purpose normal animals were used, as well as animals infected with trypanosomes, with the spirochaetae of relapsing fever and of syphilis. The discovery of a drug that will relieve and possibly cure paresis is, one would think, worth all the animals that have ever been sacrificed at the Rockefeller Institute for Medical Research since this laboratory was established even if these experiments had resulted in no other medical advances; which by the way, is very far from being the case. It would require far more space than is available in this essay to describe the benefits derived from such research.

In turning from medicine to surgery, we may omit all the history up to the time of Lister. Before that time, surgery was indeed an experimental art, but it was human experiment conducted with no anaesthesia under the most trying and heart-rending circumstances. As Dr. Keen has said these "heartbreaking tragedies often

---

[3] The Therapeutic use of Tryparsamide in Neuro-syphilis by Lorenz, Loevenhart, Bleckwenn and Hodges. J. A. M. A., May 26, 1923, Vol. 80, p. 1497.

[4] Brown and Pearce Journal of Experimental Medicine 1919, 30, pp. 417, 437, 455, 483; *ibid* 1921 33, p. 193.

made the surgeon wish he were a hod carrier or even in his grave." That surgeon was best who could snatch an arm or leg off in the fewest possible number of seconds. Those were truly the days of human vivisection, with the victim bound to the table with ropes.

How can it be possible to contemplate that period when an operation was an ordeal by torture to be followed by a long period of fever, sickness and daily ounces or pints or laudable pus, only to end in two cases out of three in death and compare it with the present day surgery, and have any patience with the person who wishes to prohibit animal experimentation. And what should we say to the one who calmly states that if there is to be any vivisection, it should be human vivisection.

Antivivisection literature contains many references to the brutality of experiments performed in the preanaesthetic days on animals. They ignore entirely the fact that anaesthetics had not yet been discovered, and cannot understand that the physician or surgeon could not be expected to be more tender toward animals than he was able to be toward his own friends and patients.

Anaesthesia and asepsis have together made modern surgery possible. The anaesthetic effect of ether was discovered by experiments on man, and the first public demonstration of surgical anaesthesia occurred at the Massachusetts General Hospital, October 16, 1846. But the discovery of some of the other anaesthetics, the study of their poisonous effects, and the development of safe procedures of administration, are largely owing to the results of animal experimentation. As for antisepsis and asepsis, it is well known that Pasteur's discoveries in bacteriology, in which animal experimentation was largely used, were the incentive and formed the basis for Lister's great contribution to surgery. What is not so generally known is the fact that Lister himself performed experimental operations on animals before he dared to carry these methods over to man. Thus in December, 1867, Lister tied the carotid in the neck of a horse after having steeped the silk in a solution of phenol. Ten days after the operation the dressings were removed and the wound was healed. As he says, "I felt justified in carrying a similar practice into human surgery." In January, 1868, he operated successfully in a similar manner on a woman with a large femoral aneurism. She made a perfect recovery. In December, 1868, he experimented on a calf, tying an artery with absorbable catgut ligatures and as the result of the success of this experiment was enabled to use such ligatures on man. Before this time, the blood vessels in an amputated limb were tied with silk.

One end was cut short and the other hung out of the wound. When suppuration was advanced, and it was hoped the ligatures had rotted loose, they were gently pulled. Care was taken that they should not be pulled on severely until the tenth or twelfth day. When they did come away, secondary haemorrhages frequently followed and were very fatal. Of 2,235 such cases of haemorrhage in the Civil War 61.7 per cent died.[5]

Antiseptic surgery was adopted between 1875–1880. During the Civil War, blood poisoning, erysipelas, lockjaw, hospital gangrene and septic infection were the common results of practically every operation. In wounds of the intestines, the mortality was 99 per cent. In 66 cases of amputation at the hip, 55 died. Of 155 cases of trephining 95 died. A clean operation was unknown. Now a surgeon considers himself at fault if a single operative wound fails to heal by first intention without infection and the abdominal cavity and the brain are entered fearlessly, and even the lungs and heart are operated on successfully.

Many operations are attempted and the technique perfected on animals before they are tried on patients. So that today we may say that all our modern surgery is the direct or indirect result of animal experimentation. That without it, surgery as we understand it today would have been impossible. One is appalled at the consideration of what we as military surgeons would have faced in the recent war, had the operative conditions of the Civil War existed.

Contrary to popular belief, the military surgeon is frequently compelled to be an obstetrician. Although Oliver Wendell Holmes and Semmelweis had demonstrated how puerperal fever was transmitted, their work never received proper recognition and indeed was openly scouted by many prominent obstetricians. It was the discovery of the streptococcus and the dramatic announcement by Pasteur in 1878 that this organism was the cause of puerperal fever that settled this question forever. We owe our ability to prevent this dreadful infection that at times in the past carried off 75 per cent of puerperal cases, chiefly to bacteriology, which as we shall see has developed by and through animal experimentation.

We pass now to the consideration of a topic of even more direct interest to the military surgeon, namely, the control of infectious or communicable diseases.

---

[5] Modern Antiseptic Surgery, by W. W. Keen. Pamphlet XII. On Defense of Research, issued by Council on Defense of Medical Research of the American Medical Association.

EXPECTATION OF LIFE AT BIRTH
Principal Countries or States at Various Times

Country—Year	Expectation at birth	Country—Year	Expectation at birth
England and Wales:		Sweden:	
1838–1854	40.88	1816–1840	41.53
1871–1880	42.98	1841–1845	44.27
1876–1880	43.56	1846–1850	43.48
1881–1890	45.42	1851–1855	42.57
1891–1900	45.95	1856–1860	42.31
1901–1910	50.45	1861–1870	44.60
1910–1912	53.42	1871–1880	46.95
		1881–1890	50.01
		1891–1900	52.28
		1901–1910	55.75
United States (Reg. States):		Massachusetts:	
1901	49.24	1855	39.77
1910	51.49	1890	43.48
1920 (Orig. Reg. States)	55.16	1895	45.35
1920 (Total Reg. States)	56.32	1901	47.75
		1910	51.19
		1920	55.25

The fact that the expectation of life is considerably greater today than it was fifty years ago is common knowledge, but is so important that certain figures are quoted here (p. 431) from a recent address:[6]

The figures for England and Wales show that the average length of life between 1838–1854 was nearly 41 years, whereas from 1910–1912 it was 53.4 years. In about 6 decades there has been a gain in the expectancy of life of twelve and one-half years. On the continent the best historical data are for Sweden, and here the figures show a gain of fourteen and a quarter years in the interval of about seven decades. In our own country the first table of value is for Massachusetts, whose figures correspond essentially with those of England and Wales for the same period, and show a gain of eleven years during a half century, and a gain of 15 years of life during a period of 65 years. In the Registration Area of the United States there was a gain of six years during the years between 1901 and 1920.

Most of the extension of life referred to above is chiefly the result of the control of infectious disease. That this is true is shown by the following facts: (1) An analysis of life tables shows

[6] The Possibility of Extending Human Life, by Louis I. Dublin. Address delivered before the Harvey Society of New York, Dec. 16, 1922.

that the majority of the improvement has occurred among the earlier years of life. There has been little if any improvement after the age of fifty when the degenerative diseases like heart disease, kidney disease, apoplexy, and cancer appear. Indeed some of these rates as well as the accident rates are actually increasing. (2) The deaths from infectious diseases have been consistently and progressively lower. The major pestilences of man, such as cholera, plague, typhus, yellow fever, smallpox, are all under control and epidemics such as we used to experience can never occur again in any country having an effective sanitary service. Tuberculosis has declined in actual mortality and in incidence. The statement was made by Dublin that since 1911 this desease has declined 50 per cent among those insured in the Metropolitan Company, and almost as much in the general population of progressive cities. We know little of the incidence of syphilis, but if not decreasing, it is at least being more effectively treated. The Journal of the American Medical Association[7] has kept a yearly record of the decrease in typhoid fever which was formerly almost a major pestilence in so many of our cities. Thus in Philadelphia from 1860–1890 the typhoid death rate varied between $^{6}/_{100}$ per hundred thousand. From 1890–1900 the rate fell to 30, but rose again between 1900–1910, the rate exceeding 70 on two occasions. In 1912 filtration for the entire city was completed, and pasteurization of milk has been general since 1914, with the result that for the years 1916–1920 the typhoid death rate has been reduced to 4.9 per hundred thousand. This reduction has affected most cities as shown by the following table:

Total Average Typhoid Death Rate (1910–1921)

	Total population (57 cities) estimated by the U. S. Census bureau methods	*Typhoid deaths*	*Typhoid death rate per* 100,000
1910	20,996,035	4,114	19.59
1911	21,545,014	3,391	15.74
1912	22,093,993	2,775	12.56
1913	22,642,972	2,892	12.77
1914	23,191,951	2,408	10.38
1915	23,740,930	2,068	8.71
1916	24,205,359	1,842	7.61
1917	24,740,068	1,647	6.65
1918	24,971,278	1,557	6.23
1919	25,526,186	987	3.87
1920	26,154,013	921	3.52
1921	26,561,469	978	3.68
1922	26,936,843	851	3.15

[7] See J. A. M. A., March 10, 1923, Vol. 80, p. 691.

Now the antivivisectionist claims that this progress has been made as the result of sanitation, and we are quite disposed to agree with him, only perhaps we differ from him considerably as to what constitutes sanitation. If physiology and pharmacology are indispensable to the art of the physician practicing internal medicine, a knowledge of the etiology of disease is no less necessary to the sanitarian. For in order to prevent disease, a knowledge of its primary cause is usually requisite, and in the case of an infectious disease a knowledge of how it is transmitted from person to person is essential. Now this knowledge concerning the infectious diseases is due almost entirely to the development of the science of bacteriology with its related subjects, protozoology and serology. For example, the reduction in incidence of typhoid fever has been clearly brought about by providing large urban populations with pure water and milk. But this costly sanitary improvement would certainly not have been inaugurated, to say nothing of carrying it to completion, had it not been for the demonstration that the disease is caused by the typhoid bacillus which is present in the discharges from patients having typhoid, and thence carried to water and from water to milk and thus to healthy persons. Similarly the eradication of typhoid from the army is due directly to the introduction of compulsory typhoid vaccination in 1910. This measure could certainly not have been taken without the discovery of the typhoid bacillus and much preliminary animal experimentation. The eradication of cholera, and the great reduction in the prevalence of dysentery and other intestinal diseases, particularly those of infants, are to be attributed to these same sanitary improvements which had their inception in the development of bacteriology. The typhoid bacillus was not discovered until 1880. The tubercle bacillus was discovered in 1882, the cholera vibrio in 1883, Bacillus diphtheriae in 1883, the bacillus of tetanus in 1889, the bacillus of plague in 1893 and the dysentery bacillus in 1898. Thus we see how very recent is the science of bacteriology, and we may expect in future even more rapid lengthening of the expectancy of life as the more recent discoveries concerning the causation of disease become popularized and made a part of the sanitary code. Discovery follows discovery so rapidly that the execution of sanitary measures now lags far behind our scientific knowledge. But we see plainly why life expectancy has increased.

Now what has all this to do with the title of our article, the benefits derived from animal experimentation? Why simply this, that not one step of this progress could have been made without

animal experimentation. For in order to prove that a certain organism is the cause of a disease, it is necessary that it should be constantly found in the disease, then that it should be isolated in pure culture upon artificial media, and finally it must be shown that this pure culture will produce the disease when fed to or inoculated into a susceptible animal. Human patients refuse to have experiments performed on them. Their universal cry is "try it on a dog first," and they are quite right. No man would send for a doctor if he was not convinced that the physician would do all in his power to alleviate his individual sufferings. If the doctor can learn anything in the process, well and good; but no experiments please. Nor would it be justifiable to use our fellow-man as the object of experiment in any case where the same information could be secured by experimentation on animals. This is an ethical question concerning which a few extremists hold other views, but upon this point there can never be any serious difference of opinion. So when each new organism is discovered, its pathogenic properties must be determined upon animals.

And it was, of course, as the result of such experiments on animals that it was discovered by Behring and Kitasato in from 1890–1892, that the blood serum of animals immunized against the poisonous products or toxins of diphtheria and tetanus, would protect other animals against the products of these bacteria. Such antitoxic sera have been widely used in recent years and have enormously reduced the death rate from diphtheria and tetanus. It would be easy to quote statistics in this connection. For instance it is stated that the mortality from diphtheria in the region of the Great Lakes has been reduced from 100 per 100,000 previous to 1894 to 15 per 100,000 in 1920.[8] The antivivisectionists refuse to accept these statistics, and equally we cannot accept theirs. In a recent conversation with a prominent antivivisectionist he informed me that there were more deaths in England today from diphtheria than there were before antitoxin was discovered.[9] Statistics may be gathered to prove anything. Of course there is a correct method and several incorrect methods of obtaining such figures; and owing to this fact, which has been humorously ex-

[8] The following table is quoted from Park, "The Rôle of Animal Experimentation in the Discoveries Leading to our Present Knowledge of Diphtheria." Defense of Research Pamphlet No. XXII, American Medical Association, 1911.

[9] Park states in 1911, "From the last Register General's report we find that there were in England and Wales 8,609 deaths in 1889, 10,516 deaths in 1894, 10,301 deaths in 1899 and 5,889 deaths in 1908 from diphtheria and membranous croup. The death-rate in 1889 was 30.3; in 1894, 34.7; in 1899, 32.4, and in 1908, 16.6 per 100,000."

Combined statistics of deaths and death-rates from diphtheria and croup in New York, Brooklyn, Boston, Pittsburgh, Baltimore, Philadelphia, Berlin, Cologne, Breslau, Dresden, Hamburg, Konigsberg, Munich, Vienna, London, Glasgow, Liverpool, Paris, Frankfurt.

Year	*Population*	*Deaths from diphtheria and croup*	*Deaths per* 100,000
1890	16,526,135	11,059	66.9
1891	17,689,146	12,389	70.0
1892	18,330,737	14,200	77.5
1893	18,467,970	15,726	80.4
1894	19,033,902	15,125	79.9
1895*	19,143,188	10,657	55.6
1896	19,489,682	9,651	49.5
1897	19,800,629	8,942	45.2
1898	20,037,918	7,170	35.7
1899	20,358,857	7,256	35.6
1900	20,764,614	6,791	32.7
1901	20,874,572	6,104	29.2
1902	21,552,398	5,630	26.1
1903	21,865,299	5,117	23.4
1904	22,532,848	4,917	21.8
1905	22,790,000	4,323	19.0

* Introduction of antitoxin treatment.

pressed by the saying "figures do not lie but liars figure," it is improbable that any antivivisectionist has ever been convinced by statistics. But there is another method of approach. A person must believe his senses. If a stone is dropped in water it will either sink or float. If anyone believes it will float, let us try the experiment. Many antivivisectionists believe that bacteria are not the cause but the product of disease. Let them go to a laboratory where the following experiment may be performed. We will take twelve healthy white rats from the same cage and stock. Into six of them we will inject a pure culture of plague bacillus and into the other six a similar amount of plain sterile bouillon on which the culture was grown. Now I say that the six rats receiving the plague will all die in the course of a couple of days, and that the other six will live. Will anyone who thinks bacteria do not cause disease step up and see the experiment performed? Or take diphtheria antitoxin concerning whose benefits the antivivisectionist is so skeptical. We will take twelve healthy guinea-pigs of the same age and weight. Into all twelve we will inject what we say is a lethal dose of diphtheria toxin which is simply the filtrate of a broth culture of diphtheria bacilli which we here show you. Into six of these animals, which you may select, we will now inject a fully protecting dose of the despised antitoxin. Now I say that the six pigs receiving the antitoxin will all live and the other six not so protected will all die. Seeing is believing; place your bets, gentlemen. Anyone who is not willing to be so shown is not sus-

ceptible to reason and it is useless to waste further time upon him or her.

Within the limits of an essay it is hopeless to attempt to take up each disease in order and show how all we know today concerning its causation and often its treatment is due directly to animal experimentation; but we will cite some further instances. The parasite of malaria was of course discovered by microscopic examination of the blood of man. But the cycle of development in the mosquito was worked out with a closely related species, proteosoma, which is a protozoon infecting birds, and this could only have been done by sacrificing, not animals in this case, but birds. It is entirely owing to this information obtained by Ross in 1897 that we are now enabled to take sanitary measures against malaria by reducing the number of mosquitoes, through screening and other antimosquito measures. Furthermore, had it not been for this work, Reed would hardly have discovered that a mosquito was the intermediate host of the yellow fever parasite.

The Treponema pallidum, the organism causing syphilis, was discovered by Schaudinn in 1905. He was encouraged to search for it because in 1903 Metchnikoff and Roux had succeeded in transmitting the disease to monkeys. This proved that the organism producing the disease was present in certain secretions. In 1907 Parodi showed that syphilis could be inoculated into rabbits. The development of the modern treatment of syphilis by salvarsan, the 606 of Ehrlich, or to speak more correctly, arsphenamin, was dependent absolutely upon the previous experiments showing that syphilis could be transmitted to animals; and numbers of rabbits were sacrificed in developing this therapeutic agent. The best single sanitary measure for the control of syphilis today consists of early treatment by arsphenamin, whereby the infected individual is rendered noninfectious and incapable of transmitting the disease to others. If every case could be treated before an opportunity occurred to transmit it, the disease would disappear. It should be noted that not only was this specific for one of our most prevalent and fatal of diseases, discovered as the direct result of animal experimentation, but that every batch of this drug manufactured must be tested upon animals prior to its use on human beings. Arsphenamin contains arsenic and some batches of this drug might be very toxic and produce a considerable number of deaths when injected. In order to avoid these fatalities, in accordance with law, each lot is tested upon animals at the hygienic laboratory of the Public Health Service in Washington. Every lot of arsphenamin

that does not conform to this test is rejected and cannot be placed on sale. The potency and harmlessness of each lot of diphtheria and tetanus antitoxin is similarily tested in this laboratory before it can be placed on sale. It will thus be seen that the necessity for such animal experimentation has been long recognized and authorized by law.

Rabies or hydrophobia has been known from antiquity, and Galen is said to have recommended crawfish eyes as a remedy. In 1780 a prize was offered in France for the best method of treating rabies, and Le Roux won it by recommending cauterization. At this time persons suspected of having rabies were often killed by being shot, strangled or suffocated between mattresses, and in 1810 a bill was introduced forbidding the killing of persons suffering from rabies.[10] This indicates sufficiently the ignorance of that day and the terror inspired by the disease.

Zinke in 1804 proved by inoculation experiments that the saliva of the rabid dog is infectious. Galtier in 1880 produced rabies in rabbits by inoculating them with the saliva of a child suffering from rabies.

Pasteur and his assistants commenced their investigations in 1881, and transmitted rabies to dogs by inoculating brain and saliva containing the virus on the brains of healthy dogs. After many animal experiments Pasteur demonstrated that the purest and most concentrated virus is located in the central nervous system, and that the virulence of this virus was progressively lowered by drying. When dried for a sufficient number of days it was no longer capable of transmitting the disease. With this as a basis, Pasteur developed his now famous method of protective inoculation, and on July 6, 1885, he was enabled to treat a boy who had been bitten two days before by a mad dog. The child was protected and did not develop rabies.

With regard to the effectiveness of this treatment it may be said that of individuals bitten by rabid dogs and untreated, between 6 and 14 per cent die of rabies, while of 152,829 collected cases so treated, but 705, or 0.46 per cent, died. Many of these fatal cases received the treatment too late. Therefore, as the result of animal experimentation we have learned to prevent the development of rabies, a uniformly fatal disease, in the vast majority of cases; and we have learned the method by which it is contracted. It may be prevented by muzzling dogs. England is an island and can be readily quarantined. As a result of quarantine of dogs and muz-

[10] Hygeia, June, 1923, p. 155.

zling, rabies was eradicated from England for many years. The disease was re-introduced into England during the war when an infected dog was brought in by aeroplane, but has been stamped out again.

After this bird's-eye view of the dependence of modern sanitary improvements on animal experimentation, we should take a glance at the results of these improvements on sanitation in the military services. The diseases that in the past have caused the greatest morbidity and mortality among armies and navies may be classified as follows:

1. Respiratory or sputum-borne diseases. Tuberculosis, pneumonia, influenza, diphtheria, cerebro-spinal meningitis, measles, mumps, scarlet fever, smallpox.
2. Venereal diseases. Syphilis, gonorrhoea, chancroid.
3. Insect-borne diseases. Malaria, yellow fever, typhus, trench fever, plague.
4. Intestinal diseases. Typhoid, dysentery, cholera.
5. Deficiency diseases. Beriberi, scurvy.

Let us take these diseases and see what has been accomplished.

Tuberculosis.—The organism producing the disease and the method of transmission have been learned as the result of animal experimentation. Based on this information measures have been taken which have reduced the incidence of tuberculosis in the military services to a rate even lower than that obtaining among civilian communities.

Pneumonia.—The organism, producing the disease, and the method of transmission have been learned, and a serum that is fairly effective against Type 1 pneumococcus has been produced. All by animal experimentation.

Influenza.—The causative organism is probably the bacterium pneumosintes, discovered as the result of animal experimentation. Although we cannot as yet prevent the disease, our only hope of doing so lies in learning more concerning its method of transmission.

Diphtheria.—The causative organism and much concerning its method of transmission are known. A curative serum, diphtheria antitoxin is available, and also a skin test, the Schick test, by means of which we may determine susceptible individuals. As a result of this information, all acquired by animal experimentation, military sanitary authorities are able to cure promptly sporadic cases that occur and to prevent these cases from spreading.

Cerebro-spinal Meningitis.—The causative organism and much

concerning its transmission is known. A curative serum has been produced that is exceedingly effective, reducing the mortality from about 75 per cent in untreated cases to about 25 per cent. This was all the result of animal experiment, as a result of which we are able to save many cases, and the incidence of the disease can be controlled in the military services to a considerable extent.

Measles.—The organism causing measles is unknown but much has been learned by animal experiment concerning its method of transmission.

Scarlet Fever.—We have been unable to produce scarlet fever in animals and as a result know little concerning it. The causative organism is unknown.

Smallpox.—The causative organism is unknown, but we have learned by human experimentation that the disease may be prevented by vaccination. The disease can be and usually is prevented in the military services.

Syphilis.—The causative organism has been discovered and a specific, arsphenamin, and a prophylatic treatment developed, all as a result of animal experimentation.

Gonorrhoea and Chancroid.—We have been unable to learn much concerning either disease by animal experimentation as animals are not susceptible to them. It is noteworthy that the treatment of both gonorrhoea and chancroid has improved little in the past twenty years as compared with the treatment of syphilis.

Malaria.—The method of transmission was demonstrated by animal experiment. As a result, the incidence of the disease can be controlled, and the method of transmission of yellow fever was suggested and afterward demonstrated by human experiment. It has been repeatedly shown that malaria infested zones can be cleared up and that yellow fever may be eradicated from any particular focus of infection with comparative ease. In the past armies have been prostrated by these infections. In the future, an epidemic of either will be considered as a disgrace to the sanitary authorities.

Typhus.—The method of transmission by the bite of infected lice was worked out by animal experimentation. This disease, which formerly decimated armies and the crews of ships may now be controlled. It was held in control on the Western front during the last war. Typhus can never again appear in epidemic form among any people or military service whose sanitary officers are wide awake.

Trench Fever.—The causation of this disease was undoubtedly

suggested by what had been already learned concerning typhus fever. The spread by the bite of infected lice was demonstrated by human experiment on volunteers, since no animal was known to be susceptible. As a result, trench fever can and should be controlled in the future.

Plague.—The causative organism was discovered and the method of transmission learned by animal experiment. Plague can probably never occur again in epidemic form among military services with a good sanitary personnel.

Typhoid.—The causative organism is known and the method of transmission. A prophylactic vaccine has been produced. All this has resulted from animal experimentation. It is unnecessary to state that typhoid has been practically eliminated from the military services as the result of the use of this vaccine. Practically the same may be said for dysentery and cholera. Vaccines are not quite as effective in these diseases as in the case of typhoid. But they are still excellent prophylactics and when combined with necessary sanitary measures, it is certain that neither dysentery or cholera should afflict armies in the future as they did in the past.

Beriberi.—In the past this disease seriously incapacitated certain armies and navies. In 1898 Eijkman discovered that fowls were subject to a similar condition when they were fed on an exclusive diet of polished rice. Nearly all that we have learned concerning this disease, as the result of which we are enabled to prevent it with a high degree of certainty, has been learned from feeding experiments on birds and animals.

Scurvy.—This disease was also formerly a major plague of soldiers and sailors. Through actual experience and human experimentation it was learned that oranges and lemons would cure and prevent this disease. But in 1912 it was found that scurvy could be produced in guinea pigs, and by experimentation on these animals we have learned more concerning scurvy since 1912 than was learned in all the previous centuries.

From this outline it is clear that during the last fifty years we have learned to control practically all the diseases that in the past produced the greatest morbidity and mortality in the military services. That by far the greatest part of this advance is clearly the result of animal experimentation, and that our only hope of learning more concerning diseases like measles and influenza that as yet we cannot fully control, lies in further animal experimentation.

A large part of the successful art of writing lies in knowing

when to stop, and this essay is already too long although the subject is by no means exhausted. As illustrations of the wealth of material that is untouched I will mention two. First, when the Germans violated their treaty obligations and introduced gas as a weapon, the allied armies were obliged to learn immediately the physiological action of these gases, and to develop methods of treatment for the cases that were gassed. This information was promptly secured by means of extensive experimentation on animals. In this instance not only humanity but also military necessity demanded that these experiments be performed. Secondly I would merely allude to the extensive use of animals in the diagnosis of disease. We need only mention the use of the guinea pig in the diagnosis of obscure cases of tuberculosis, and the use of the guinea pig and rabbit in the Wassermann reaction for the diagnosis of syphilis, to indicate how widespread and important is this usage.

In conclusion I would state that the fact that numerous people remain unconvinced of the value of animal experimentation in spite of the above facts which have often been presented to them, reminds us of the cynic who said that the human mind possesses infinite ability to resist the introduction of knowledge. We cannot hope to convince everyone by these or other facts. But we may rely confidently on such facts to convince the great majority of our fellow men.

TRAINING THE MEDICAL STUDENT FOR SERVICE IN TIME OF WAR

By Lieut. Colonel HENRY H. RUTHERFORD
Medical Corps, United States Army

The Wellcome Second Prize Essay, 1923

TRAINING projects in general specify and define the objects sought to be attained. They elaborate and fix upon curricula—programs of subjects and courses required to be taught and mastered. They specify and provide, or require, training facilities such as time allowances, calendar and schedule arrangements, arrangements for offices, classrooms, laboratories, literature, equipment, etc., etc. They also specify and fix upon a standard student quality involving mental, moral and physical pre- and post-requisites. They expect that instructors shall be consistently conscientious and skillful in their employment of the modern scientific methods of teaching.

The project for the military training of medical students—the Reserve Officers' Training Corps—must aim to give such a combination of basic general and technical instruction and training, to the greatest number of available suitable students, as will provide an adequate foundation for their subsequent military careers; namely, intelligent interest and cooperation in service, as members of the Officers' Reserve Corps. The project must frame a curriculum, suitable for this purpose, that will be feasible under the conditions that obtain in the majority of the "Class A" medical schools. It must also authorize and provide facilities that will be adequate under the circumstances.

There are at present two outstanding conditions that oppose success in the military training of medical students. These are: (1), general lack of interest and confidence in the undertaking and its outcome, and (2), shortage of available time and opportunity during school sessions, for additional training work. The first of these conditions can be removed with time; the other one will remain an obstacle more or less permanently.

Lack of interest and confidence is mainly due to the fact that no course of military training has ever before been carried on in a medical school. The conservative school in the nature of things (lack of spare time from crowded curricula, etc.) is loath to take

on additional work that seems foreign to the school's prime purpose. The condition is also due to the fact that an adequate school of military training for medical students has not as yet been developed: The courses have not been fully and finally crystallized; adequate, appropriate literature (Shockley's "Outline of Medical Service of the Theatre of Operations" is a long step in this direction), available and accessible for study and reference, has not accrued in concrete form; the staff of teachers is as yet inexperienced in the game and unskilled in the art of teaching. This causes difficulty for the instructor and doubt in the mind of the student or school authority, who would be shown. Perhaps the post-war reaction of many members of the medical profession has had its effect. At any rate, all of these things can and will be righted in due course of time; they are being corrected now as rapidly as could be expected, and interest and confidence is becoming increasingly more manifest.

The brevity of time that has been found available for theoretic training in most of the schools is extreme. At present it amounts to but one hour per week (thirty per year), and it has not seemed likely that this can be improved upon very materially. There are minor differences in different schools; this estimate represents the very vast majority, the general average. The argument has been that it is simply a question of curricula being so full and exacting that the inexorable law of physics must apply—*"one body, one space, one time."* Moreover, the ruling of priority by importance has usually given the military courses last place in arranging school schedules. All of this has meant that training in schools has had to be carried on under very adverse conditions, that is, in an irreducible number of hours when students were very fully occupied with other and more important work, so far as they were concerned. And yet, with improvement in interest and confidence in the courses, it is believed that these conditions can be adjusted, as will be brought out later in this paper.

To offset these obstacles there are certain favorable conditions, the greatest of which is the relatively high grade of the medical student's intelligence, his maturity and the considerable progress that he has already attained in collateral training subjects. Students in "Class A" medical schools represent the pick from among the various preparatory colleges. A reason for this is the fact that "Class A" schools, generally, have more applicants for enrollment than they are able to accommodate. The average age of the "Class A" student on enrollment is around twenty-two years; all students

on entrance are required to have successfully completed the equivalent of at least two years' pre-medical work in the colleges of science, literature and arts, while 50 per cent, more or less, have or will have taken bachelor degrees in such colleges before or during their medical courses. The decided advantage resulting from this quality of student is obvious and manifold.

Another favorable factor is the manifest positive educational value of the courses. Quite aside from its military value, medico-military training is recognized as an asset to the civilian doctor of medicine. For instance, the principles of military organization and administration, as taught and applied in the army medical service, are known to be easily and very profitably translated to apply in the administration of civil medical affairs—hospitals, clinics, offices of Public Health Departments, etc., etc. Also, training in military hygiene and sanitation is known to augment and make more thorough the student's knowledge of general hygiene and preventive medicine.

Still another factor, of lesser importance, is the element of remuneration. This is an inducement to join and make good in the Reserve Officers' Training Corps, in the cases of many worthy students who, because of the conditions of the times and the costliness of a medical education, find themselves hard pressed for lack of funds.

Now, if the minimum requirements of the trained student are fixed upon, the nature and scope of the training (subjects) will be discovered and the minimum of time and other facilities required for the training can be demonstrated. These latter balanced against the difficulties—the conditions laid down above—will be a measure of the practicability and of the probable success of the project.

All undergraduate training may be said to have two main objectives. The first and more important is to secure an adequate mastery of essential fundamentals. In the various schools and colleges the courses are so laid out that they take the student, by natural and logical steps, nearer and nearer to this goal. Fundamental principles are studied in their constitution, their scientific significance and bearing on particular affairs and their relations; they are analyzed, synthesized and appropriated—digested and assimilated—the fundamentals, essential and indispensable to the school in question. The other major object of undergraduate training is to familiarize the student with important techniques—methods of application, technical and otherwise as the case may

be in the school in question. These objectives imply and accurately forecast minimum requirements, that is, training subjects.

The essential fundamentals of all military training must be such as pertain to the principles of military science—of organization, of tactics, and of administration. This is no less the case when the training is that of the medical student; it cannot logically be held today that the medical officer's fundamental military training should be more circumscribed than should that of the candidate for service in the line. There are techniques—of tactics, of engineering, of the mechanics, of gunnery, etc.—that are not so vitally important to the medical officer; but there are technical and administrative methods pertaining to the application of the medical sciences in military service, aplenty, to fully compensate.

It is pointed out here that training the medical student for service in war can only contemplate his service as a doctor, and hence as an officer. This fact has an important bearing upon the nature and requirements of curricula as it also has upon the quality of the student and the medical school selected for the training project.

The medico-military doctrine is the theory of a service of *"sanitation, evacuation and hospitalization,"* to raise and sustain the strength and the fighting efficiency of the forces. The service involves the work of procuring and handling the necessary personnel, plants, equipment and supplies; also that of preparing and maintaining a system of records, of individual and statistical health changes—of hygiene and sanitation and of sickness and injury. "Personnel and units (of the Medical Department) are attached to (and are integral parts of) all organizations larger than a company." "The attached personnel and units (of the Medical Department) accompany the organizations to which they pertain at all times." "Battle is the combined tactical employment of all available moral, physical and mechanical strength." "The object of the (Sanitation) Evacuation and Hospitalization Systems is to assist in maintaining the forces at maximum strength."—*Military Organization of the United States,* G. S. S.

Based upon the above argument and mindful of the conditions set forth in the beginning, the following is advanced as a general scheme of courses, a curriculum, to serve as an outline of minimum requirements. The make-up of the courses can be varied and featured, in reasonable limits, to suit circumstances that may be found peculiar to schools and to instructors.

SCHEME OF COURSES

Course numbers	Years	Calendar and hours	Contents of courses
No. 1. Basic.....	1 and 2	*WS / 60	The Elements of Military Science—the theory, principles and methods of war.
No. 2. Advanced.	3	FW / 45	The System of Evacuation and Hospitalization—theory, principles and methods.
No. 3.....	4	F / 15	Military Hygiene and Sanitation—theory and practice.
No. 4.....	4	S / (Camps, etc.) / 250½	Camp and Field Service Duties—practical.

* F, fall; W, winter; S, spring.

The first, Basic Course, will aim definitely to give the student a clear general conception of the Army in all of its parts. It should consist of such subjects as the nature and meaning of military science in the abstract; the military theory, policy and organization of the United States; tactics and the nature and significance of the fundamental principles thereof; organization for tactical and for administrative purposes; command, its significance and its functions; the organization, powers and limitations of the combatant arms; minor tactical operations; the special and technical services, their relations to the tactical branches and their administrative procedures; military laws and administrative and tactical regulations; orders, correspondence, records and reports; *the soldier, his requisite qualifications and the theory and methods of his training; discipline, esprit and morale; and the customs and courtesies of the service* (to be made a major subject of the course). Company administration should be taught categorically, and a brief reading course in military history should be required.

The second and third, Advanced Courses, will aim to give the student a knowledge of the medical department, in all of its parts, and a general familiarity with the methods and techniques of its various activities and functions.

The course in Evacuation and Hospitalization should consist of such subjects as the theory, the personnel and the organization of the medical services; medical functions in war—in the Zone of the Interior and in the Theater of Operations; the application of the fundamental principles of tactics in the medical service of the Theater of Operations; the essentials of logistics and field engineering that are necessary in carrying out the medical services of

combat; casualty estimates and the fundamental principles of the Evacuation and Hospitalization Systems; the techniques of the field aid treatments and of the standard methods of collecting, sorting and transporting wounded; the Regimental Medical Detachment—its organization, equipment, administration and functions; the Divisional Medical Regiment—its organization, equipment, administration and general functions; the Sanitary, Ambulance and Hospital Companies—their organization, equipment and functions in detail; the details of the evacuation movements to, through and beyond the Evacuation Hospital; Hospital Trains and Ships; and General, Embarkation, and Station Hospitals.

Hospital Organization and Administration should be taught categorically, and a brief reading course in the History of Military Medicine should be required.

The course in Hygiene and Sanitation should treat only the problems peculiar to the military establishment and should treat these more largely in an administrative way, and from a practical standpoint. This for the reason that most all "Class A" medical schools provide, and require, courses in General Hygiene and Sanitation. The course should deal with recruiting work and physical surveys; personal hygiene and prophylaxis; the food and water problem; the disposal of wastes; clothing and foot gear; and physical training—all under war conditions. Sanitary methods in movements of troops and in camps should be presented in detail and sanitary inspections and reports should be taught in school and actually performed in camp and elsewhere.

The course in practical Camp and Field Service duties will aim to familiarize the student with the actual performance of the more essential of the duties of a junior medical officer, by *conferences, demonstrations,* and *exercises.* (It goes without saying that this course should be superimposed upon the other courses and its first installment will usually be given in the six weeks camp prescribed by the War Department.) It will need to include: (1) exercises in the routine formalities of official personal, and general tactical and administrative duties—involving reference to military law, army regulations and the customs and courtesies, and (2) exercises in the routine personal and general technical—medical department—duties—involving reference to regulations and to the medical department theory, principles and methods in general. Under the first class will fall such subjects as personal equipment—uniform regulations; procedures in connection with receiving and complying with personal assignment and travel orders—personal corre-

spondence, reports and returns, pay, property, etc.; reporting for duty and taking station; company administration—Special Regulations 57; drill and command, rifle company tactics, field engineering, to cover map reading and military sketching; command functions; board work, court-martial procedure, etc. Under the second class will fall such subjects as personnel, organization, equipment and administration of the regimental and divisional medical units; routine post and camp sanitary orders, inspections and reports; recruit examinations, physical inspections and prophylactic work; routine field service duties—actual set up and operation, under tactical conditions, of the different stations of the combat medical echelons.

The question as to whether or not these courses contain substantially the training that will best provide an adequate foundation for the student's future military career is open to little doubt. The fact that they do, within limits, is self-evident; there is no alternate line of training. The practicability of the successful carrying out of the courses, under the circumstances, must be shown. For this purpose take the case of the first course—Elements of Military Science, etc.—and let there be allotted a minimum total of sixty hours, distributed by subjects, as laid down above, somewhat as follows:

	Hours
1. Military science, defined and discussed—(Reference being made to Military History)	1
2. Military theory, policy and organization of the United States	2
3. Tactics and principles	3
4. Organization, tactical and administrative	4
5. Command and command functions	4
6. Powers and limitations of the arms; tactical operations	10
7. Special and technical services; administrative procedures	10
8. Military law and regulations (Medical Department Regulations)	4
9. Orders, correspondence, records and reports	4
10. Discipline, esprit and morale	2
11. Customs and courtesies	2
12. Disciplinary training (of the soldier)	10
13. Company administration	4
Total	60

Now, anyone conversant with the time element required in lecture, conference, textbook, quiz and classroom (school) work, and the manner in which the above subjects have been handled heretofore, will find that these estimates are entirely feasible. The thing has been done. In fairness, however, it must be admitted that when

the course is given in this time limit it is bound to be very superficial, all the more so unless given under favorable conditions of calendar and schedule arrangement, quality students, available suitable literature, etc., etc.

The second and third courses may be considered similarly—by assigning hours to subjects somewhat as follows:

SECOND COURSE—EVACUATION AND HOSPITALIZATION

	Hours
1. Refresher, first course	1
2. Medical theory, personnel and organization	3
3. Medical operations in war and application of tactical principles	2
4. Logistics and engineering	2
5. Casualty estimates and principles and methods of evacuation and hospitalization	8
6. Technique and methods, field aid, collecting, etc	3
7. Regimental medical detachment	4
8. Divisional medical regiment	2
9. Sanitary, ambulance and hospital companies	9
10. Evacuation to rear—evacuation hospital to base, etc	2
11. Hospitals	6
Total	42

THIRD COURSE—HYGIENE AND SANITATION

1. Recruit and physical examination	2
2. Personal hygiene and prophylaxis	2
3. Food and water	2
4. Wastes	2
5. Clothing	2
6. Physical training	1
7. Moving troops	3
8. Camps	3
9. Inspections	1
Total	18
Total hours, course 2	42
Total	60

In the case of these two courses the task will be easier, because the subject matters are more concrete and they are more in line with the student's primary technical training. Not being so broad in their general scope, the student will be able, in the time allowed, to gain a more thorough knowledge of the subject matter, as he should do. But here again there will be the same need of favorable conditions of scheduling, literature, etc.

In the fourth course, which is purely a practical one (in camp

and also at other places when feasible) the practicability is neither a question of time nor is it one of facilities. Camps take place during vacations and all facilities are or can be supplied. It is then fair to assume in this case that practicability is a foregone conclusion.

Now, if these courses make up a suitable and a practicable curriculum, from the viewpoints of the object to be attained and the time element allowable, then there remains only to show what are the facilities, other than the time allowance, that will be needed in school, and whether or not such facilities are within reasonable reach.

A consideration of the question can be prefaced with the proposition that the more extreme the paucity of the time allowable, the more urgent the need for all possible facilities and aids. The training subjects must be calendared and scheduled to best advantage; instructors, selected and detailed for their capabilities, must be authorized to control the organization of their classes and they must be provided with adequate office and lecture rooms, literature, equipment, etc., etc. A textbook for use in supplementing, extending and standardizing lecture and conference teaching is indispensable.

Calendar and schedule arrangement is based upon the principle that continuity and intensity of interest and attention are facilitated by a reasonable frequency of instruction periods. For instance, an allowance of thirty hours for instruction will avail much more if the hours are scheduled so as to fall at the rate of two to three per week, over a shorter lapse of time, than would be the case if they were scheduled so as to fall at the rate of but one per week throughout the entire thirty-odd weeks of the school year. Similarly, course periods will avail more if they are calendared so as to fall as nearly continuously, one into the next, as possible. Again, as the value of the schedule arrangement of the hours of a course can be enhanced by the selection of advantageous and opportune days and hours, so can the value of the calendar arrangement of the courses of a curriculum be improved by the advantageous and opportune timing of the course periods, of quarters, trimesters or semesters. Following this argument to its logical conclusion would result in the scheduling of three hours per week over the last four quarters of the junior and senior years in school—if practicable.

The fact that the ideal arrangement, as to calendar and schedules, is not practicable—because of school curricula, etc.—

does not affect the validity of the argument. It merely points to the desirability of the best compromise. This will vary with different schools, with variations in their curricula. It is unlikely that more than two thirty-hour quarters could be gotten in any single school year, or that this could be done in more than one or two years—junior and possibly sophomore years. Such arrangement would not necessarily be wholly desirable; there is no profit in trying to teach students whose minds are already fully burdened, etc.

In this connection it is pertinent that in a number of the "Class A" medical schools—of state universities that are land-grant institutions—the vast majority of students have received from one to two years' credits for military training, prior to their entering the medical schools. This fact makes such students eligible under the present regulations, to defer their enrollments in the Reserve Officers' Training Corps until their sophomore or junior years. In one training unit the case of such students has been taken advantage of in an effort to test the practical profit of condensing the entire sixty hours of the first and second year basic courses, heretofore given at the rate of one hour per week throughout the freshman and sophomore years, into one quarter—the spring of the sophomore year. The results have been all that could have been hoped for and appear to justify the recommendation that such calendar arrangement be authorized when and wherever feasible and desirable at other schools. Calendar arrangements conforming to this general idea of condensation are shown in the Scheme of Courses.

Finally, following out the above idea with reference to the most desirable year in which to place the camp course would, it seems, result in a selection of the summer just following the spring of graduation and just preceding the year of interneship. This plan has also been tried out with a number of students and found to be by far the most satisfactory and fruitful of profit in training.

To make the application clear, under what appears to be the most adverse circumstances, the instance of the "four-quarter" school may be cited. In this school one-half of both junior and senior classes take one-quarter of their year's work during the summer months. Moreover, because of the fact the two sections of each class, in the nature of things, are never on the same schedules in school, it is rarely possible to get a common schedule for their military courses. In this school, therefore, the most profitable, feasible plan for using the minimum time allowance—one hundred and twenty hours—would seem to be somewhat as follows:

forty-five hours, at two hours per week for two quarters, sophomore year; forty-five hours, at two hours per week for two quarters, junior year; thirty hours, at three hours per week for one quarter, senior year. But in this school it turns out that it is possible to get an allowance of sixty-six hours, at two hours per week for three quarters of the sophomore year; forty-four hours, at two hours per week for two quarters of the junior year, and thirty-three hours, at three hours per week for one quarter of the senior year—a total of one hundred and forty-three hours for theoretic training. Furthermore, in this school it has been found practicable to carry on a correspondence course in Camp and Field Service Duties, during the latter two quarters of the senior year—when students are in local hospitals as junior internes.

With curriculum, and calendar and schedule arrangements settled, the next consideration is the eligibility requirements of schools, students and instructors.

Regarding the schools, it is understood that at present none but those of "Class A" rating are authorized to organize and maintain units. But if for any reason, such as lack of funds, shortage of personnel for instructors or what-not, a limit must be placed on the number of schools, it seems very clear that the right thing to do is to seek out and determine to what extent a school is willing and able to cooperate and supply help in the shape of time allowances, schedule arrangements, office and classroom facilities, etc., before granting authority in its case. Manifestly the school that is granted a unit and then takes and maintains a lukewarm, unsympathetic and unhelpful attitude, should have its authorization withdrawn and deferred in favor of another more willing to cooperate.

The eligibility requirements of the student may be said to amount simply to this: he must have character and earnestness and he must possess a sufficiency of aptitude and adaptability for the military profession. In short, as the sole aim of the project is to produce officers, the student must be fit timber for the making of an officer and at any time—before or after enrollment—that he shows unmistakable signs of not being so fitted he should be rejected forthwith, as is provided for in Special Regulations. Training is expensive and the frivolous and inept are serious and active detriments to the well-being of the training project. In general it is a safe enough assumption that none but the negligible few of the students of the high-grade "Class A" schools are wholly undesirable.

Similarly the eligibility requirements of the instructor, though

of even more vital importance, may be expressed in few words. He must be able as a teacher; he must have an absolutely thorough knowledge of the subjects he is to teach, and he must have the ability to impart what he knows. He should be a good administrator (manager), a tactful, patient diplomat, and he should be polished and exemplary in his habits and bearing. An unsuitable instructor on the job, at this stage of the game, could easily do such harm as would be most difficult to efface.

There has apparently been no trouble in selecting and detailing suitable instructors, in so far as their personal and managerial qualities are concerned; nor, for that matter, as regards the native talent for teaching possessed by them. It is in the matter of their proper preparation, so that they shall be able to teach well and successfully, that there has been sore need of something as yet not brought to light. Now it seems that the essentials necessary in the teaching art are: (1) a reasonable degree of aptitude and liking for the work, (2) a familiarity with teaching principles and methods, and (3) *a thorough knowledge of the subjects to be taught.* It is safe and reasonable to assume that most officers put on this duty have aptitude and liking for the work and that they possess a sufficient understanding, enough to begin with, of the teaching art. A facile and thorough knowledge of the subjects of the courses cannot be so assumed. All medical officers do know the subjects theoretically, and in a general way, and doubtless they are thoroughly familiar with necessary practical details; but there are few who have had occasion or opportunity to master the subjects in the thorough and intimate manner that is indispensable to successful teaching. Only very recently has the *modern* "medico-military science and tactics" been conceived as a definite entity, and even now a complete and standard treatise on the subject in concrete form, does not exist. Lack of literature then appears to be the real crux—a system of text-reference books the paramount need. It is by no means meant to be implied that the teaching should be carried on exclusively, or chiefly, by the textbook-lesson-quiz method; rather is the present and primary need for a text that of serving the purpose of a students' and instructors' reference, the basis of a uniform and standard guide in the preparation of all of the various instructors at all of the various schools. But under the circumstances there is every other good reason for a suitable system of textbooks, viz.: (1) it will tend to make the courses more uniform, as they should be in all units; (2) it will help to secure continuity of interest over the periods of months and years, in

school and out, whenever active training must of necessity be infrequent and interrupted; (3) it will serve as one of the chief means of securing the maximum results in the minimum of time available for school work—by making it possible to carry on training at home, by the job and correspondence methods; (4) it will tend to satisfy the demands of the more exacting of the interested students —a thing that should be done; and, (5) since in all modern educational undertakings the necessity of a textbook's use is understood to exist as a matter of course, it will preclude the objection by the uninitiated and the unconvinced that it seems strange that this new and untried project would not print a text if there is good substance fit to print. Says the Adjutant General, Paragraph 3, in his letter 000.862 R.O.T.C. (6/9/22):

It is generally recognized that properly prepared textbooks are essential to the complete success of military training in educational institutions. Such texts not only supply the student in a concrete form with the information he is required to have, but they also give a dignity to the course of instruction pursued and make it possible for the authorities concerned to form a just opinion as to the educational value of the subjects comprising the course.

The urgency, then, of the need for a textbook having been shown, there arises the question as to how best to get one with dispatch and economy—one that will fulfill requirements now and for the future, if possible. The following is advanced as a plan that commends itself: (1) convene a board of officers especially selected for their qualifications for the work, and let them produce the copy matter for the book, or books; (2) place the manuscript with a publisher who will contract to supply books on specifications at the lowest price; (3) specify that the books be gotten up so that they can be revised without the necessity of a new edition—by loose-leaf binding, etc.; (4) make this book the standard required for use by all units, but invite and encourage improvements, by way of revisions (loose-leaf replacements when revisions are adopted).

The details of the book's contents and construction, it is needless to say, would be left to the good judgment of the board. However, it is a reasonable assumption that the book would and should indicate the use of certain equipment and aids—exhibits in illustrating and demonstrating lessons, such as picture films and slides, maps, grams, and actual exhibits of equipments, appliances, etc. These things should and doubtless would be supplied to each unit on requisition. Finally, there should be a chapter, *in the text-*

book, on the principles of training methods and class management, for reference and guidance of students as well as instructors. Military training methods are outlined in regulations (T. R. 10-5); they are in accord with the teachings of modern schools of education, and they are wholly usable in this undertaking. They will need to be studied and elaborated and followed by instructors, as there are also many other, intangible things, techniques and tricks in the art of teaching, that will need to be acquired by individual instructors in order that they may function most efficiently. Manifestly a uniformity of methods of teaching and of management of classes, in so far as is compatible with conditions peculiar to the various schools, students and instructors, should be striven for.

The value, from every point of view, of a tactful, consistently rigid adherence to the principles of military discipline in class management, is self-evident and should be stressed, especially at this time. The exact details of achieving the effect will necessarily be the personal problem of each individual instructor, and, though none may succeed in full measure, none can afford to fail entirely. *A disciplined class, one that is habitually punctual, attentive and freely and willingly responsive, is the only kind of class capable of receiving correct military training.*

CONCLUSIONS

1. The project to give military training to medical students is practicable and can be made to pay.

2. The only permanent obstacle is shortage of available time and this can be met by arrangements to condense the courses and intensify the instruction.

3. The curriculum must embrace only the subjects necessary to provide an adequate foundation for future interest and study.

4. Courses must be timed and scheduled so as to afford the best possible advantages in teaching.

5. Authorization of training units should be deferred in schools not yet able or willing to cooperate fully.

6. Only high-grade students who are in earnest and who have sufficient aptitude and freedom for the work, should be enrolled in the courses.

7. Officers for detail as instructors should be selected with the utmost care and they should have every facility for preparation, before and after entering upon their duties.

8. An adequate (very high class especially gotten up) textbook with accessories, is indispensable.

9. The camp course should not be given earlier than the summer following the junior year. The best time for this course, in point of its value in training, is just after completion of the senior year in college.

10. A general policy of judicious but strict adherence to the principles of military discipline should be required in the conduct of all training units.

INSTRUCTION OF THE RESERVE AND NATIONAL GUARD IN AVIATION MEDICINE

By Major L. H. BAUER

Medical Corps, U. S. A.; Commandant, The School of Aviation Medicine

THE Medical Section of the Air Service, by means of the School of Aviation Medicine, is planning extended instruction of the medical officers of the Reserve and the National Guard who are attached to the Air Service.

The training will be divided into three classes:

1. Training of flight surgeons by correspondence courses and short basic courses at the school.

2. Training of examiners by special courses of four to six weeks at the school.

3. Training of specialists.

The greater number of the medical officers attached to the Air Service are those who will be expected to do the work of flight surgeons. It is considerable of a problem to train these satisfactorily. Civilian physicians cannot be expected to give up three or four months at one time attending a course of instruction, and yet they must be trained. The scheme finally hit upon is a combination of practical training at the school in the summer and correspondence courses conducted by the school during the winter. Briefly, the work will consist of two years of correspondence work, divided into two separate courses. A short basic course of practical work is taken either on the completion of both correspondence courses or half of it taken at the end of each correspondence course.

The first year's correspondence course will cover the various phases of the physical examination for flying, together with the subject-matter required as a foundation for making this examination. The course is divided into three subcourses:

1. *Ophthalmology and Otology.*—The purpose of this subcourse is to enable the student to understand the principles and theoretical basis of the ophthalmological and otological sections of the physical examination for flying.

Its scope embraces the theoretical considerations, from textbooks and papers prepared at the School of Aviation Medicine, of the importance of the eye in flying; anatomy of the eye; external, subjective and objective examination of the eye; diseases of the eye and its appendages; disturbances of vision; general optical principles; refraction; retinoscopy; accommodation; convergence; extrinsic muscles; dis-

turbances of motility; anatomy and histology of ear, nose and throat; pathology and treatment of ear, nose and throat conditions commonly met; the inner ear, its reactions, nystagmus, past pointing, falling, the brain tracts and associated centers; the flying examination.

2. *Aviation Medicine.*—The purpose of this subcourse is to enable the student to become familiar with the general methods of making physical examinations, including that for flying, the tests of circulatory efficiency and the study of the newer methods in cardiology.

Its scope embraces the theorectical considerations from textbooks and papers prepared at the School of Aviation Medicine, of cardiac pathology, diseases and defects of the heart, including valvular heart disease, the arrhythmias, myocarditis and neurocirculatory asthenia, the electrocardiograph and polygraph; the heart in aviation; the circulatory efficiency test and the Schneider index, general methods of physical examination, including that of the lungs, bones and joints, genitourinary system, etc.; the physical examination for flying.

3. *Neuropsychiatry.*—The purpose of this subcourse is to familiarize the student with the ground work in the subject of neuropsychiatry, and to consider briefly the psychic make-up of an individual particularly with reference to the selection of proper types for aviation.

Its scope embraces the theoretical considerations, from a series of papers prepared at the School of Aviation Medicine, on descriptive and genetic psychology; the nature, causes and classification of mental disorders; general symptomatology; borderline and episodic states comprising constitutional psychopathic inferiority and the psychoneuroses; methods of examination; neurological examination for flying; and personality study.

The second year correspondence course will cover the study of the effects of altitude, physiological and psychological; the altitude classification examination; physical fitness; and the care and maintenance of the flyer. It will be subdivided into four subcourses.

1. *Neuropsychiatry.*—Its purpose is to familiarize the student with the major psychoses and the types and trends of personality.

Its scope embraces the theoretical considerations of dementia precox; manic depressive psychosis; paresis; the paranoias; psychoses associated with organic diseases and injury to the brain; symptomatic, infection-exhaustion, and toxic psychoses; presenile, senile, and arteriosclerotic psychoses; defective mental development.

2. *Aviation Physiology.*—Its purpose is to familiarize the student with the general physiological effects of aviation; the effects of and compensation to altitude; the altitude classification test; the subject of physical fitness, and the care and maintenance of the flier from a physiological standpoint.

The points covered will be the theoretical considerations from textbooks and papers prepared by the School of Aviation Medicine, of the general physiological aspects of aviation; physiological effects of climatic factors other than altitude; the hematorespiratory function of the blood; laws of respiratory absorption and dissociation; the demand for oxygen and rate of oxygen consumption; anoxemia, classification and methods of producing each kind; altitude sickness and the symptoms of other low oxygen experiences; the compensations to low oxygen with comparisons of the temporary and permanent varieties of reaction in the following: respiration, blood, hematorespiratory function of the blood, circulation, metabolism; physiologic considerations of muscular exercise, including muscles, body temperature, respiratory, circulatory and metabolic changes; physical fitness, comparison of trained and untrained; fatigue and staleness; the measurement of fatigue and fitness; considerations of various physical fitness tests including the Schneider Index.

3. *Aviation Psychology.*—The purpose of this subcourse is to familiarize the student with the psychological effects of flying and altitude, and tests for same.

Its scope embraces the theoretical considerations of the standard psychological tests; general psychological principles; psychological tests of efficiency; emotion and its relation to efficient reaction; psychophysical tests, American and foreign; effects of alcohol and caffeine on efficiency.

4. *Administration.*—Its purpose is to familiarize the student with various protective devices used in aviation; equipment and organization of the Air Medical Service; and the administrative duties of the flight surgeon.

The two years' correspondence work will cover the theoretical side of aviation medicine. There will be lesson assignments and examination in each field. There will be prescribed reading and a broad field of collateral reading.

The short basic course at the school will cover clinical and practical application of the theoretical considerations had in the correspondence course. The program will be as follows:

1. *Aviation Medicine.*—Practical work in physical examinations, including the use of the fluoroscope, polygraph, and electrocardiograph, clinics and cardiology; intensive review of the theoretical considerations in the correspondence course.

2. *Neuropsychiatry.*—Practical work in neuropsychic examinations and in the neurological section of the flying examination; clinics in psychiatry; intensive review of the subject covered in the correspondence course.

3. *Ophthalmology and Otology.*—Practical work in ocular muscle balance, refraction, and in the ophthalmologic section of the physical examination for flying; clinics in ophthalmology; intensive review of the subject covered in the correspondence course.

4. *Aviation Physiology.*—Practical work with the altitude classification examination; gas analysis; rating; low-pressure chamber; tests for physical fitness; intensive review of the theoretical considerations in the correspondence course.

5. *Aviation Psychology.*—Practical work as psychologist in the altitude classification examination; psychological tests of the aviator; review of the theoretical considerations considered in the correspondence course.

6. *Administration.*—Administrative work in the flight surgeon's office; paper work of the flight surgeon; consideration of aviation accidents; organization and equipment of branch units.

On the completion of the first year's correspondence course and half of the short basic course satisfactorily, the student will be reported as qualified to make the physical examination for flying according to Form 609, W. D., A. G. O. Following completion satisfactorily of both correspondence courses and the whole of the short basic course, the student will be rated as a flight surgeon.

The work will be of value to any physician regardless of whether or not he is to be attached to the Air Service. The work in cardiology covers the very latest diagnostic methods and theories. The work in psychiatry covers very thoroughly the psychoneuroses with which every physician comes in contact. The work in physiology includes the physiology of respiration and circulation, including blood chemistry and basal metabolism, which are so closely associated with internal medicine today.

The second class of training is that devoted to selected Reserve and National Guard officers. The instruction will consist of about six weeks' training at the School of Aviation Medicine. The ground covered will be so far as possible that contained in the first year's correspondence course and the first half of the short basic course. Attempt will be made to qualify the student as a "609 examiner" by the end of the course. The work will consist of lectures, recitations, practical work, clinics, prescribed and collateral reading.

The third class of training will be that arranged for specialists. There are a number of officers in the Reserve Corps who are physiologists, psychologists and ophthalmologists, etc. These officers were associated with the experimental work while in the service. They would be called on in case of an emergency to carry on further experimental

work and to act as instructors in the school. These courses will be designed for the special needs of the individual and will be aimed to familiarize him with the progress of aviation medicine so far as his own subject is concerned and the correlation of that progress with related subjects.

Carrying out these lines of training, by the time of another emergency, we should have flight surgeons, physical examining units and specialists ready to step in and aid in the rapid expansion of the Air Service which would take place at that time.

SPECIFIC PREVENTION AND SPECIFIC TREATMENT OF LOBAR PNEUMONIA

By RUSSELL L. CECIL, M.D.

Special Expert, U. S. P. H. S., Assistant Professor of Clinical Medicine, Cornell University Medical School, New York City

DURING the past four years we have been studying the pneumonia problem from two different angles, prophylaxis and treatment. The problem of prophylaxis has been studied experimentally with vaccines on animals and, to a less extent, in the field. The problem of specific treatment has also been studied experimentally on animals and on patients in the wards of Bellevue Hospital.

In this article I shall present a brief summary of the results which have been obtained.

THE SPECIFIC PROPHYLAXIS OF PNEUMONIA

Pneumonia is perhaps the most serious infectious disease that the sanitarian encounters in his fight against bacteria. Tuberculosis appears to be on the wane, and the investigations of Von Pirquet, Shick and Park have provided a simple method for preventing diphtheria. Finally, modern sanitation has reduced dysentery and typhoid fever to the status of rare diseases. In the case of pneumonia, however, the incidence and death rate have remained persistently high for the reason that no satisfactory method has yet been devised for its control.

In approaching the problem of the prophylaxis of pneumonia much can be learned from consideration of typhoid fever. There is one striking difference between the two diseases. An attack of typhoid fever usually confers lifelong immunity against reinfection, whereas the immunity following an attack of pneumonia is comparatively short-lived—one or two years at the most. With this exception, however, the two diseases have a good deal in common.

In respect to typhoid fever, the effectiveness of prophylactic vaccination was convincingly shown during the recent war when troops drank water from ditches and filthy streams; yet by reason of previous vaccination they rarely developed typhoid fever. Fortunately there is a much simpler method of controlling typhoid fever. Pure water and milk supplies are eliminating the disease so rapidly that typhoid vaccination will soon be entirely unnecessary in civilized communities.

There is no such simple and natural method of preventing pneumonia. Here the infection is transmitted by direct or indirect contact, and as long as people continue to crowd into cities where close contact is

inevitable pneumonia will menace public health. No practical method of preventing droplet infection has been worked out. By necessity, therefore, we are driven to look for some method of artificial immunization. Within the last few years several efforts have been made along this line. Probably 95 per cent of all cases of lobar pneumonia are of pneumococcal origin. Even in the case of broncho-pneumonia, pneumococcus Type IV plays a considerable rôle. The problem of preventing pneumonia, therefore, depends for its solution upon the practical application of the principles of pneumococcus immunity.

The first point to note is that after an attack of pneumococcus pneumonia a high degree of immunity exists against the homologous type of pneumococcus. This fact has been demonstrated by experiments on both animals and man. As indicated above, this immunity is probably not permanent, but it unquestionably exists.

In the second place, a high grade of immunity can be produced in animals by three subcutaneous or intravenous injections of pneumococcus vaccine. In our experiments on monkeys we have succeeded in immunizing these animals against all four types of pneumococcus pneumonia.

In the third place, it is possible to vaccinate man against pneumococcus pneumonia with three subcutaneous injections of pneumococcus vaccine. This was shown in the experiment on soldiers at Camp Upton and, in a less convincing way, at Camp Wheeler. At Camp Wheeler, however, only one injection of vaccine was made in each individual, and it has since been found that one inoculation will not confer an adequate immunity on monkeys, no matter how large the dose. The results at Camp Wheeler were doubtless marred still further by the use of lipo vaccine instead of saline vaccine. It has recently been shown that bacteria suspended in oil have less antigenic potency than the same bacteria suspended in saline.

The value of pneumococcus vaccine was well shown in the experiment conducted by Von Sholly and Park on employees of the Metropolitan Life Insurance Company. These investigators vaccinated 1,536 persons with a mixed vaccine directed primarily against the milder respiratory infections. The vaccine contained pneumococci of the three fixed types, *Streptococcus viridans*, *Streptococcus hemolyticus* and *Bacillus influenzae*. In this experiment a control of 3,025 persons remained unvaccinated. Only one case of pneumonia developed among the 1,536 vaccinated employees, while eleven cases, or five times as many, occurred among the unvaccinated controls.

Other experiments could be cited, but space does not permit a detailed survey of this subject. Suffice it to say that the experiments

on animals and the experiments on man have placed the principle of prophylactic vaccination against pneumonia on a sound scientific basis.

In vaccinating against pneumonia an ordinary saline suspension of killed pneumococci is employed. In our work in the Army, and since then in institutional work, I have used a polyvalent vaccine composed of equal parts of pneumococcus Types I, II, and III. We have never advocated the addition of pneumococcus Type IV, as this group is composed of a large number of different strains of pneumococci all biologically unrelated. The Army Medical School vaccine was originally made up so that 1 c.c. contained 9 billion pneumococci, 3 billion of each type. I still recommend this concentration.

There are a number of pneumococcus vaccines on the market, but most of them are not sufficiently concentrated. They contain too many different bacteria (pneumococcus, streptococcus, staphylococcus, *B. catarrhalis*, *B. influenzae*, etc.), and on account of this multiplicity of strains the patient does not receive a large enough dose of the fixed types of pneumococcus. In our work on monkeys we found that small doses of pneumococcus vaccine would not protect completely against the disease.

Pneumococcus vaccine should be administered subcutaneously. Intravenous injections of pneumococcus vaccine would undoubtedly convey a higher degree of immunity, but the constitutional reactions following such injections render them impractical.

When pneumococcus vaccine is administered subcutaneously the reactions are usually mild. In our experiments on soldiers severe reactions occurred in about 1 per cent of cases. In general, it may be said that the reactions to pneumococcus vaccine are similar to those following injections of typhoid vaccine. Within twenty-four hours after the injection there is a certain amount of local inflammatory reaction which may be accompanied by frontal headache and a slight rise in temperature. Ordinarily, however, the local reaction is all that the patient complains of.

Prophylactic vaccination against pneumonia is indicated wherever large groups of individuals are living together under crowded conditions. In the last war it proved itself particularly valuable in the case of recruits. It has been used with success on the negro miners of South Africa.

Industrial workers who are exposed to the cold and wet, such as day laborers, truck drivers and chauffeurs, frequently contract pneumonia. A great many sailors are admitted to Bellevue Hospital with lobar pneumonia. Firemen, postmen and policemen are much exposed to inclement weather and might be vaccinated against pneumonia with

great advantage. Nurses and physicians in hospitals are frequently exposed to virulent pneumococci and should receive pneumococcus vaccine. Finally, there are certain people who are very susceptible to pneumonia and give a history of several attacks. During the past six or seven years I have vaccinated a number of such individuals, and in no instance has the vaccine failed to give complete protection against a recurrence of the disease.

On account of the reactions sometimes produced by pneumococcus vaccine when injected subcutaneously, it was desirable that certain improvements both in the method of preparation and in the method of administration of the vaccine should be forthcoming in order that active immunization against pneumonia might have a wide application in civil life. In the first place, we found that monkeys could be readily immunized against pneumococcus pneumonia by three *intratracheal* injections of pneumococcus vaccine. This immunity was established with all three of the fixed types. Later we tried to immunize monkeys by spraying them with pneumococcus vaccine. Three of the monkeys received pneumococcus vaccine daily in the form of a vapor from a De Vilbiss atomizer. The monkeys offered considerable opposition and made it quite difficult to get the vaccine into the trachea. The monkeys were sprayed every day with vaporized vaccine for two or three weeks. Their immunity was then tested against a virulent culture of pneumococcus. The monkeys developed a mild pneumonia in spite of the spray, probably because a very small portion of the vaccine ever got into the trachea. We propose to repeat the spray experiment in the near future with improved technique. Certainly if a sufficient quantity of the vaccine gets into the trachea a high degree of immunity should be produced.

Whether pneumococcus vaccine is to be given intratracheally or subcutaneously, it would be desirable to work with a less toxic product. With this aim in view, W. A. Perlzweig, working in our laboratory, has been testing the antigenic power of various chemical fractions derived from pneumococcus. In a recent report he has shown that extracts of pneumococcus antigen could be prepared from pneumococci digested with trypsin, and that such an antigen conferred as high an immunity in mice as that produced by the ordinary saline suspension of killed pneumococci. The trypsin digest is non-toxic for animals and produces practically no reaction in man.

In consideration of these facts, I believe that we may expect to have soon a water-soluble, non-toxic pneumococcus antigen, suitable for subcutaneous injection or for use in an ordinary atomizer. By spraying with this antigen during deep inspiration, two or three times a

week, an individual would become well immunized against the three fixed types of pneumococcus pneumonia. I do not see how there could possibly be any injurious effect from the use of such a vaccine. Unless some unforeseen objections arise, this method of specific prophylaxis against pneumonia should prove harmless and effective, and, if it comes into general use, may do much toward reducing the incidence of the disease.

THE SPECIFIC TREATMENT OF LOBAR PNEUMONIA

Since the work of Cole and his co-workers at the Rockefeller Hospital, Type I antipneumococcus serum has come into fairly extensive use in the treatment of Pneumococcus Type I pneumonia. No specific treatment of any kind has been worked out for the other types of pneumococcus pneumonia, and even in the case of Pneumococcus Type I infections, serum treatment has not proved to be altogether practical for the general practitioner. The chief reason for this has been the difficulty and delay connected with the proper typing of sputum.

During the last two years we have been working with a modified anti-pneumococcus serum at Bellevue Hospital. This preparation was first worked out by F. M. Huntoon, of the Mulford Laboratories, and is nothing more than a water solution of the immune bodies originally contained in polyvalent anti-pneumococcus serum. By a very ingenious procedure Huntoon was able to extract the immune substance from the anti-pneumococcus serum and redissolve it in water. This product is known as pneumococcus antibody solution, and contains protective bodies against Pneumococcus Types I, II, and II.

The advantages of this preparation are: (1) It is polyvalent—that is, it is aimed against the three fixed types of pneumococcus; and it has also shown itself to be of value in the treatment of Type IV pneumonia. By reason of its polyvalent character, typing of the sputum is no longer absolutely necessary, and treatment of the patient can be instituted as soon as the diagnosis of lobar pneumonia has been made. (2) Pneumococcus antibody solution is practically free from horse protein, hence there is no danger of anaphylaxis or serum sickness. This removes a great source of worry for the physician and discomfort to the patient, and there is therefore no reasonable limit to the amount of antibody solution that can be administered. (3) The fact that the preparation is a water solution renders it very soluble and easy to absorb when injected subcutaneously.

The antibody has usually been administered intravenously in doses of 50 to 100 c.c., the technique being similar to that of serum administration. Injections are given once or twice, sometimes three times a day. The reaction produced by intravenous injection of antibody is very

characteristic and striking. In twenty to forty minutes after the injection the patient usually begins to shiver and is soon in a hard chill, which lasts from fifteen to twenty minutes. At its conclusion the patient complains of fever and the temperature may have risen to 106° F. or even 108° or 109°. This high temperature usually persists for only a short time. The rapid fall is accompanied by a profuse perspiration, which may continue for several hours. The fall in temperature may be slight, but is often extensive, amounting to 8 or 10 degrees. It may be temporary or permanent, depending somewhat on the stage of the disease. These reactions are very similar to the so-called "foreign protein" reaction and are probably due to a disturbance in the colloid equilibrium of the blood. The dose of antibody administered does not bear any close relation to the character or severity of the reaction. In one patient 10 c.c. may produce a severe chill, while another patient may tolerate 100 c.c. without any reaction whatever. The reactions are more severe when treatment is started late in the disease.

During the past three years this solution has been tested on a large scale in the wards of Bellevue Hospital. Through the kind cooperation of the various directors all cases of lobar pneumonia admitted to the twelve medical wards were studied bacteriologically, and on six out of the twelve wards practically every case of lobar pneumonia was treated with intravenous injections of pneumococcus antibody solution. The other six wards were used as control wards. In these wards patients with pneumonia received no antibody, but in other respects were treated practically the same way as the patients who received antibody. Specific treatment was started as soon as the diagnosis of pneumonia was made. The results of this experiment are shown in Table I.

In 401 cases of pneumococcus pneumonia treated with antibody the death rate was 19.9 per cent. In 448 control cases the death rate was 28.3 per cent, almost one-third higher. Streptococcus pneumonia was not benefitted by the antibody treatment.

The results of treatment with antibody were more striking in cases that were treated early in the disease. For example, in Table 2 it will be noticed that the death rate for Type I pneumonias treated during the first forty-eight hours of the disease was only 8.9 per cent, while control Type I cases admitted to the hospital during the first forty-eight hours of the disease showed a death rate of 23 per cent. Similar reductions are noticed in the other types. Altogether, 114 pneumococcus pneumonias treated with antibody during the first forty-eight hours of the disease showed a death rate of only 13.1 per cent, whereas 157 pneumococcus pneumonias in the control series ran a death rate of 26.7 per cent, practically twice as high.

TABLE I.—*Comparison of Death Rate in Treated and Control Series*

Cases treated with antibody				Control cases		
Type	Cases	Deaths	Rate	Cases	Deaths	Rate
			Per cent			*Per cent*
Pneumonia I	157	21	13.4	175	41	23.4
Pneumonia II	78	22	28.2	76	31	40.7
Pneumonia III	57	20	35	60	24	40
Pneumonia IV	109	17	15.6	137	31	22.8
Total	401	80	19.9	448	127	28.3
Strept. Hemolyt	21	10	47.6	21	9	42.8
Strept. Vir	7	1	14.2	10	1	10

TABLE II.—*Death Rates for Pneumococcus Pneumonias Receiving Antibody during the First 48 Hours of Disease. Control Shows Death Rates for Pneumococcus Pneumonias Admitted to Control Wards during the First 48 Hours of Disease.*

Cases treated with antibody				Control cases		
Type	Cases	Deaths	Rate	Cases	Deaths	Rate
			Per cent			*Per cent*
Pneumonia I	56	5	8.9	68	16	23.5
Pneumonia II	24	5	20.8	25	8	32
Pneumonia III	10	1	10	19	7	36.8
Total	90	11	12.2	112	31	27.6
Pneumonia IV	24	4	16.6	45	11	24.4
Total	114	15	13.1	157	42	26.7

It is difficult to explain why Type IV pneumonia should be favorably influenced by pneumococcus antibody solution, as this agent is not supposed to contain any immune substance against Pneumococcus Type IV. Evidence is accumulating, however, to show that Pneumococcus Type IV is made up of atypical fixed types; in other words, the Type IV strains represent aberrant forms of Types I, II and III. If this hypothesis is correct it would readily explain the beneficial effect of antibody on Type IV pneumonia.

Upon the evidence which has been presented we must conclude that pneumococcus antibody solution is a therapeutic agent of considerable power. The effect is most striking when the antibody is administered early in the disease, but it may also be of value in the latter stages by

neutralizing the circulating toxins. The most dramatic effects are observed in Type I infections, but good results can also be obtained in the other types when antibody is used early and in large doses.

More recently we have been studying the effect of antibody when administered subcutaneously. By this procedure, one avoids entirely the severe reactions which follow the intravenous injection. These reactions are often very uncomfortable and, in certain cases, actually dangerous to the patient. The subcutaneous injections cause some local reaction, but this rapidly subsides. We have treated only 51 cases of pneumonia by the subcutaneous method, but the results so far are just as good as those obtained by the intravenous injections.

This preparation is still a new remedy and will certainly be subjected to improvement as time goes on. A method must be devised for still further concentrating the antibody, and it would also be desirable to eliminate the shock reaction which follows intravenous injection. Even in its present form, however, pneumococcus antibody solution marks an important step in advance in the specific treatment of pneumonia, and I believe that it will be along this line that an efficient mode of treating the disease will ultimately be worked out.

From this brief review it will be seen that the investigations herein referred to have opened up a number of interesting and promising leads in the field of pneumonia research. Neither the vaccine nor the antibody in their present form are perfect products, but both are theoretically sound and with continued improvement should do much toward mitigating the high incidence and the high mortality of lobar pneumonia.

THE NATIONAL PSYCHE VS. TOXIC CHEMICAL WARFARE—A VULNERABLE SECTOR IN THE LINE OF NATIONAL DEFENSE[1]

By NORVELLE WALLACE SHARPE, M.D., F.A.C.S.
Major, Medical Officers' Reserve Corps, U. S. A.

I

THE purview of this analysis excludes consideration of the chemistry of toxics and the pathologic phenomena induced by their employment for military purposes. Furthermore, the historic phrase "poison gas," in so far as the present discussion is concerned (and probably also as a phrase to be used colloquially), might well be definitely abandoned, in view of the fact that World War development exhibited an increasing tendency to deliver on the field the various toxic chemicals compressed into liquid or solid form (gaseous form being assumed only when released from pressure) toxic chemicals and chemical warfare will be found to be appropriate substitutes.[2]

This arbitrary exclusion permits attention to be concentrated upon certain indubitable and fundamental facts connected with toxic chemical production and employment, and a reasonable and appropriate attitude to be developed and maintained thereto.

II

Evidence is both overwhelming and conclusive that long antedating the World War Germany had been making preparation on a large scale for anticipated hostilities. American travelers in Germany will doubtless recall being confronted with the war tax imposed upon the usual conveniences and necessities of life. Among the numerous, excellently devised and thoughtfully elaborated plans for anticipated warfare must be included toxic chemical production. For many years Germany had been a leader in chemistry and the practical application of chemistry to the production of substances of great and far reaching practical value. The mind naturally gravitates to fertilizers, synthetic drugs and dyes. The

[1] An address before The Surgical Association of the Rock Island R.R. System, Kansas City, Mo., September 12, 1923.

[2] The following gases were the more frequently employed during the World War: Phenyl Carbylamine Chloride, Mustard gas, Diphenylchlorarsine, Ethyl-dichlorarsine, Sym-dichlormethyl-ether, Diphosgene Chlor-picrin, etc., etc.; roughly classified as lachrymatory, vesicant, sternutatory, asphyxiating, toxic.

production of such articles necessitated the availability of highly trained chemists of research caliber, an adequate manufacturing personnel, chemical laboratories, and plants properly equipped and adequate in production capacity.

It is difficult to convey to the mind not conversant with such matters the huge obstacles and the enormous expense incident to the development of these preliminary essentials. Without minimizing in the slightest degree this notable pragmatic evidence of German *Kultur,* it is but fair to record that cordial governmental backing and far-seeing governmental economic policies made possible German dominancy in the synthetic chemical field; a dominancy more striking in that all other countries exhibited a pronounced mental and commercial inertia to the exceeding importance of a highly specialized and abundant chemical productivity, contenting themselves with a few scattered plants, an entire absence of coordinated plan or effort, and a cheerful willingness to purchase from Germany her excellent and diversified synthetics. It is quite probable that the majority of the world assumed that the early employment of toxic chemicals by the Germans in the vicinity of Ypres in 1915, was but another evidence of Teutonic *Schrecklichkeit,* devised during the heat of conflict and utterly disconnected with any long established economic or commercial foundation. It is also highly probable that, in those darksome days, there was vouchsafed to but very few a fair and adequate comprehension of the menacing import of the world-famed synthetic chemical industry of Germany, and that the wind-borne gas waves of Ypres were but the fluttering leaves precursing the coming tempest, a tempest that has radically altered modern military strategy and tactics—a tempest made possible by the long established and world-famed synthetic chemical industry of Germany. It is not known, on indubitable authority, when, nor where, nor how, the feasibility of toxics for military purposes took its genesis in the German psyche. But to those juvenile minds that have assumed that the Yprian cloud-waves were but a child of the day, it is well that certain corrective and informative facts be conveyed.

The spectacular achievements of the guns of Krupp and Skoda are widely known; in particular the havoc wrought by the 42-cm. howitzers on the Belgian fortifications during the early offensive. But it would be well to remember that while the missiles of huge caliber, enormous weight, and terrific impact of the early days, were in no sense ever discarded—yet the tactical employment of gases during later periods assumed such great importance that it might well be

considered that the toxic atom demonstrated a greater effectiveness than the ton of steel. Is it generally known and properly evaluated that in the campaigns of 1918 the German guns were firing over 50 per cent toxic chemicals? From whence were they derived? The answer is obvious. It has been noted that Germany possessed, long antedating the World War, a highly organized and adequately equipped synthetic chemical manufacturing group; this diversified industry functioned under the caption Interessen Gemeinschaft. Study of this organization, whose titanic growth was evidential not only of German intelligence (highly trained), of Germany foresight (uncannily clear), of German commercial policies (astutely wrought), but also of German governmental backing liberally and persistently accorded, is advised. Even though the necessary delimitations of time and space imposed by the present occasion forbid orientation of the development of this world-famed industry, yet such a careful study will abundantly repay any thoughtful mind. Is it necessary to elaborate upon the readiness and the ease with which this highly organized and abundantly equipped peace-time industry, normally engaged in the production of manifold and highly useful peace-time products, could be diverted, well nigh between suns, and made to function in the vast production of toxic chemicals invaluable for aggressive combat purposes? Precisely this occurred; Germany held in full productivity and ready of access the tactical advantage of surprise and initiative. The effort developed at Ypres, while astonishingly disastrous to the Allies, was equally astonishingly successful from the German angle, when the modest investment of time, money, matériel and personnel be thrown in the balance. In addition to the tactical element of surprise and initiative must be noted that the striking success of toxic gas as developed at Ypres must be classed as a definite tactical accomplishment, for it involved the further age-long element of surprise and unpreparedness—there is no reason to question that this fundamental tactical element will continue to be employed; but it must be likewise borne in mind that this early accomplishment was later largely supplanted by the use of toxics in rendering uninhabitable certain well defined and strategically important areas.

In justice to Teutonic acumen and preparedness it is to be noted that evidence is available that the Kaiser Wilhelm Institute and the (nearby) Physico-Chemical Institute were engaged in toxic gas research so early as August, 1914; that shortly thereafter they were experimenting with the highly toxic cacodyl oxide and phosgene (it is thought for use in hand grenades). Professors Haber and

Sachur (the latter subsequently perished from arsenic oxide fumes) were prominently identified with these early efforts. Haber himself apparently was present at the Ypres toxic offensive. The description by Schwarte (Die Technik im Weltkriege), concerning the specially organized and trained troops and the elaborate gas technique that was developed, is both interesting and highly suggestive of the early and complete preparations made by the Germans in this field.

With knowledge of the high toxicity of their products and the extreme readiness with which such could be manufactured and effectively delivered on a large scale, the German chemists were amply justified in enthusiastic recommendations. Oddly enough the German General Staff reacted but moderately, with the net result that an enormous tactical advantage was lost in not pressing to the utmost the success of Ypres; for it is but a reasonable statement that, pending adequate gas-mask equipment, adequate gas discipline, and adequate toxic chemical production by the Allies, Germany held a potential dominancy that aggressively pushed might well have permanently turned the fortune of war in favor of the Central Powers. This is the more surprising when we find Schwarte recording that "G. H. Q. considered the attack near Ypres to be a successful experiment. The impression created was colossal, and the result not inconsiderable, although it was not fully realized from the tactical point of view. It was obvious that we had gained a great advantage: the enemy was not sufficiently prepared with defensive measures against gas."

The original gas attack at Ypres was followed two days later by another; four attacks were launched during May, 1915, in the vicinity of Hill 60. Sternutatories (double salts of dianisidine) were given a trial, but the irritant types (xylyl bromide, xylylene dibromide, bromo-acetone, brominated methyl ethyl ketone) proved far more effective. Lachrymators (brominated xylene and brominated ketones) were employed at Loos. By June, 1915, lethal substances were being made available. General Falkenhayn's orders regarding use of gas shell are evidential that the German General Staff had finally adopted toxic chemicals as standard offensive equipment. July, 1915, saw the first employment of the *Flammenwerfer* at Hooge. Gas initiative was again sought by Germany in December, 1915, when high concentrations of phosgene and chlorine were delivered northeast of the Ypres Salient. The last cloud attack on the British front occurred August, 1916; later attacks were made against the French, but the German General Staff from

now on employed other methods as a matter of first choice. The offensives on the eastern front were so similar in tactical significance to those on the western front that discussion would seem to be needless.

III

Allusion has been made to the Interessen Gemeinschaft, its admirable, adequate and flexible productive capacity; to investigations with toxic chemicals substantially antedating the Ypres Offensive; to the tactical success achieved at Ypres and later; and to the hesitancy of the German General Staff in pressing to the utmost the initiative gained during that period. A brief survey of the Allied reaction to toxic chemicals merits consideration.

At all points, from Ypres to the armistice, the advantage of priority (due to a long-standing and stabilized industry of advanced type) lay with Germany, to offset which it became an immediate and a vital necessity for the Allies to develop protective measures and a counter offensive. Following a brief period of widespread indignation and dismay, there was noted another brief period of intense activity in developing a suitable protective gas mask. This original mask (of exceeding simplicity and somewhat notable crudity) proved quite inadequate for later toxic chemical developments; it was modified frequently and radically and gradually assumed certain fairly stabilized types. A gas discipline was evolved, a policy of gas reprisals was adopted and developed, and progressive production of toxic chemicals fostered, to keep pace with a constantly increasing demand which continued with absolutely no cessation up to the close of hostilities. The effort to equal, and if possible, surpass the productive capacity of Germany proved an enormously difficult task; for so inconsiderable were the combined pre-war synthetic industries of the Allies that it may be fairly held that the creation of this colossal source of supply was essentially *ab initio*. The expense was extreme, the period of delay and non-coordinated action was distressingly protracted and of profound tactical disadvantage, with a resultant measurable impairment of morale not only in the theater of operations but also in the respective national interiors. So profound was the condition developed, and so obvious was the dominancy of the Central Powers manifested in this field at this period, that it would be wise to admit that as the possession of the initiative lay with the enemy, the ultimate outcome of the World War may well have been brought to a calamitous conclusion had not the Teutonic psyche (even with

the odds, all in its favor) failed to press to an obvious and crushing conclusion its fairly attained tactical advantage. But the crucial period passed, the Allied powers caught their stride, adequate masks were made available, a rigid gas discipline was devised and enforced, toxics were supplied to the theater of operations in ever-increasing quantities, the tide of conflict was turned, the Teutonic psyche again notably exhibited its customary unwillingness to withstand the impact of continuous reverses, and the war was won.

It might be assumed that with all advantages in her favor, Germany would herself have been amply prepared and forewarned against any toxic chemical effort that might have been developed by the Allies. Oddly enough this proved not to be true, for even in the earliest reprisals of the British at Loos, September, 1915, a very substantial measure of success was attained. Schwarte (Die Technik im Weltkriege) makes note as follows:—"The English succeeded in releasing gas clouds on a large scale. Their success on this occasion was due to the fact that they took us by surprise. Our troops refused to believe in the danger and were not sufficiently adept in the use of defensive measures as prescribed by G. H. Q."

In general this reaction was also found later at Givenchy December, 1915; again later during the Somme offensive, July, 1916, and thereafter up to the close of the war. The Germans exhibited no immunity to the element of surprise, the degree of Allied success being predetermined not only by the completeness of our preliminary preparations and plans, the abundance of our supplies, the competency of our personnel, and the effectiveness of our assault, but also (in no small measure) upon the adequacy of the protective measures maintained by the enemy.

Non-immunity by the Germans is clearly proved by the following evidence, which is significant:—

Probably the most marked feature of the captured documents or of prisoners' statements during the later stages of the Somme battle was the continual reference to the deadly effect of British cloud gas. The captured letter of a German soldier writing home stated: "Since the beginning of July an unparalleled slaughter has been going on. Not a day passes but the English let off their gas waves at one place or another. I will give you only one instance of this gas; men 7 and 8 kilometers behind the front line became unconscious from the tail of the gas cloud, and its effects are felt 12 kilometers behind the front. It is deadly stuff." The accuracy of this reference to the long-range effect of our gas clouds is borne out in a number of other statements. For example, we learnt from a prisoner examined by the French: "The men were

thrown into disorder and raised their masks because they were suffocated. Many fell in running to the rear; a number did not become ill until the next day. Vegetation was burnt up to a depth of 8 kilometers." Again, prisoners taken at Maurepas stated that one of the English gas attacks was effective 10 kilometers back. There are also marked references to the surprise nature of our gas attacks, which are an unconscious tribute to the successful tactical developments which have already been referred to, and also numerous other references to the "delayed" action of phosgene. The prisoner mentioned above, taken at Maurepas, gave testimony that some were only taken ill after several days, and one died suddenly two days after, whilst writing a letter. One prisoner, pointing to Les Ayettes on the map, stated that about the beginning of September, when gas came over suddenly in the late evening, they thought it was from artillery fire because it was so sudden. No one was expecting gas and very few were carrying their masks. Another one stated: "The attack was a surprise and the cloud came over and passed fairly quickly. The whole thing did not occupy more than ten minutes." More than 30 per cent of the battalion was put out of action. Finally, to show what a serious imposition this constant cloud gas attack was upon the German Army, we will quote from the special correspondent of the *Vossiches Zeitung*. He said: "I devote a special chapter to this plague of our Somme warriors. It is not only when systematic gas attacks are made that they have to struggle with this devilish and intangible foe." He refers to the use of gas shell, and says: "This invisible and perilous specter of the air threatens and lies in wait on all roads leading to the front." In a dispatch dated December 23, 1916, from Field Marshal Sir Douglas Haig, G. C. B., the situation is ably summarized: "The employment by the enemy of gas and of liquid flame as weapons of offense compelled us not only to discover ways to protect our troops from their effects but also to devise means to make use of the same instruments of destruction. Great fertility of invention has been shown, and very great credit is due to the special personnel employed for the rapidity and success with which these new arms have been developed and perfected, and for the very great devotion to duty they have displayed in a difficult and dangerous service. The army owes its thanks to the chemists, physiologists, and physicists of the highest rank who devoted their energies to enable us to surpass the enemy in the use of a means of warfare which took the civilized world by surprise. Our own experience of the numerous experiments and trials necessary before gas and flame could be used, of the preparations which had to be made for their manufacture, and of the special training required for the personnel employed, shows that the employment of such methods by the Germans was not the result of a desperate decision, but had been prepared for deliberately. Since we have been compelled, in self-defense, to use similar methods, it is satisfactory to be able to record, on the evidence of prisoners, of documents captured, and of our own observation, that the enemy has suffered heavy casualties from our gas

attacks, while the means of protection adopted by us have proved thoroughly effective. (Lefebure, "The Riddle of the Rhine.")

The World War development of toxic chemical offensive and defensive from this point onward is a matter of great importance and of great interest, but the strict limitations of this discussion forbid further orientation. Even an indifferently posted student of history can hardly fail to have recognized a forebear of the wind-borne cloud waves of Ypres in the historic "stink pots" of the Chinese; and yet further the logical development exhibited later by the Livens projector and the Stokes mortar. Nor should we fail to note an important German advance (in both accuracy and range) toward the close of the war; thus a range of 3 kilometers was attained (chiefly by rifling the bore of the projector), and a caliber of 158 mm. employed. The projector was known as *"Gaswerfer 1918,"* and could discharge either high explosive or a bomb filled with pumice granules impregnated with phosgene. If it be held that toxic gases in modern warfare be merely an up-to-date development of Chinese "stink pots," it may well be that ardent Hellenists will demand that the modern stream of blazing oil be recorded as but a variant of the ancient "Greek Fire." The *Hamburger Nachrichten* of June 9, 1918, makes the following interesting notation:

Our Flammenwerfer troops owe their origin to a mere incident. Their present commander, Major R., when an officer of the Reserve, received the order, during peace maneuvers, to hold a certain fort at all costs. During the sham fight, having employed all means at his disposal, he finally alarmed the fire brigade unit, which was under his orders as commander of the fort, and directed the water jets on the attacking force. Afterwards, during the criticism of operations in the presence of the Kaiser, he claimed that he had subjected the attackers to streams of burning oil. The Kaiser thereupon inquired whether such a thing would be possible, and he received an answer in the affirmative. Long series of experiments were necessary before Engineer L. succeeded in producing a combination of various oils, which mixture is projected as a flame on the enemy by means of present-day Flammenwerfer. Major R. occupied himself in peace time with fighting fire as commander of the Munich Fire Brigade. The "Prince of Hades," as he is called by his "fire spouters," enjoys great popularity among his men as well as among the troops to whose assistance he may be called. He can look back on an important development of his units. Whereas in January, 1915, Flammenwerfer troops consisted of a group of 36 men, today they constitute a formation with special assault and bombing detachments, and are furnished with all requisites for independent action. In reading Army Communiques, we often find mention of these troops. If difficulty is experienced in clearing up an English

or French Infantry nest, the "Prince of Hades" appears with his hosts and smokes the enemy out. That conditions of membership of this unit hardly constitute a life insurance policy is obvious, nor is every man suitable. Special men who are physically adapted and who have given proof of keenness in assault are necessary for such work.

Without minimizing the value of a developed smoke screen the effective range of the Flammenwerfer and the frank obviousness of the whole method would seem to render its offensive value of not great significance; well-directed concentration of machine-gun fire would seem to be the logical method of disposition.

It would seem that a legitimate (but limited) field of usefulness would be found in mopping up trenches and possibly preceding the assault wave on a strong point. Of necessity, such an apparatus must be of a size, weight and type of construction well within the carrying power of the soldier. Interesting experiments have been made (notably by the Massachusetts Institute of Technology) in building a flame projector of greater force, radius, and destructive power; the inherent weaknesses that were developed were size, weight, vulnerability, and danger due to possible escape of superheated steam from penetrating gun fire.[3]

If higher authority considers this super-flame-projector of tactical value, it would seem well worth enclosing one in a tank of suitable size and power, thus affording increased range of action, adequate motive power, and a fair degree of armored protection. For the present, the projection of flame is to be held as merely a subsidiary in chemical warfare, and not comparable with volatile toxics in tactical importance.

As against the extreme simplicity, long established and practical effectiveness of the German toxic chemical equipment, and the enormous tactical advantage of the initiative thus bestowed, the Allies were compelled, in the midst of the throes of the greatest of wars, to develop a policy, an equipment, a personnel, and adequate production facilities as an offset. Consider for example the German Research Centers, the Kaiser Wilhelm Institute, and the Physico-Chemical Institute, together with the highly specialized research groups of the Interessen Gemeinschaft; consider the Heeres Gasschule of Berlin, the pre-war assignment of Reserve Officers to the

[3] In a personal letter (8–30–23) from Col. Edward F. Miller, Chief, Department of Mechanical Engineering, Massachusetts Institute of Technology, he states that the earlier experimental projectors (noted ante) proved too bulky for use. Several were taken to France but were never used against troops. Later (with Maj. A. S. Smith) another apparatus was devised, compact, and safe to operate. Through an aperture 2 inches in diameter, a flame could be projected 100 feet. Further details he was unable to supply as the matter was held confidential.

Interessen Gemeinschaft, the subsequent development of the chemical section A. 10 by the War Ministry. Not unduly to multiply details, yet further consider the fact that at Höchst 300 trained chemists constituted the peace-time staff, that at Leverkusen alone there was a staff of 1,500 technical and commercial specialists before the war and that an additional 1,500 were added during the war, and that at Ludwigshaven the Badische Anilin und Soda Fabrik was in all probability the most important section of the Interessen Gemeinschaft. Consider the schools formed for training officers in toxic chemical offensive and defensive, the fact that regiments were assigned a *Gass-schutz Officier* (with suitable assistants), that special gas regiments were developed from time to time, that a *Kommandeur der Gastruppen* was stationed at G. H. Q. Under orders of General Ludendorff, dated June 18, 1918, special gas shell experts were detailed with Divisional Artillery Staffs; these maintained a close liaison with the divisional gas officer. The logical development may thus be noted, by which the later enormous employment of toxic chemicals by the artillery was achieved.

In general the Allied reaction paralleled the German method, bearing in mind, however, that the advantage of priority always lay with Germany. The British may fairly serve as typical of the Allies; for neither in the zone of the advance, the entire theater of operations, at G. H. Q. nor in the zone of the interior was there any adequate conception of toxic chemical possibilities, much less a trained personnel, or adequate source of supply. But the crushing pressure of a vital necessity stimulated titanic efforts and served as warrant for the expenditure of colossal sums.

Through the cooperation of the Royal Society prominent scientists gave unstinted time and effort in the solution of the toxic chemical problem; the Medical Services were charged with the huge task of combatting the effects of toxics, past, present and future; a Trench Warfare Department was authorized by Lord Kitchener; a Scientific Advisory Committee was formed; a Commercial Advisory Committee functioned in liaison; the Imperial College of Science, together with other British universities, cooperated loyally; testing and experimental grounds were constructed; anti-gas respirators were devised, improved from time to time and manufactured in huge quantities; the toxics themselves became available (as the tedious and shockingly expensive task of developing productive plants progressed), and under trained minds were delivered in different forms for field service, most significant, perchance, being the use of toxics in the form of gas shells. It is impossible on this occasion to do

justice to the enormous and highly complex task imposed on the Allies by the German toxic chemical policy, nor yet, on the other hand, to bring into proper relief the extreme simplicity and effectiveness of Teutonic toxic production.

By reason of long delayed entrance into active hostilities America was not confronted with the problem in its most acute and perplexing phases; as a matter of fact we drew lavishly and constantly upon the dearly bought experience of our Allies, and were thus enabled to assume our load with comparative ease. Not scourged into a frantic reaction superinduced by a precipitate subjection to an unique offensive, whose devastating effectiveness was made possible by our own humiliating unpreparedness, our consideration, our adoption, and our development of chemical warfare was characterized by an analytic detachment and a judicial clarity wholly impossible for our Allies, who had been compelled to bear the crucible testing of the furnace. We participated in Allied conferences and councils, we assigned officers with the British Gas Troops in France, likewise with the research laboratories of the French, special organizations were authorized and trained for chemical warfare—Hanlon Field, near Chaumont, became an important experimental station, and a suitably equipped laboratory was erected at Puteaux. By so doing the severe handicap imposed by our extremely long line of communications was measurably reduced. Possibly our most significant achievement was the construction of the famous Edgewood Arsenal, specifically adapted to chemical warfare purposes. Its main equipment was for the production of chlorine gas on a vast scale, together with other toxic chemicals that the World War had shown to be effective. Its shell-filling section had a daily output in excess of 200,000. It is probably not generally known that a research organization was also developed that included 1,200 technical men and 700 service assistants, and that exhaustive study was made on more than 4,000 substances.[4] It should be noted in passing that a reasonably satisfactory liaison was established with various commercial chemical plants. We are probably fully justified in holding that we produced our proper proportion of toxic chemicals; yet, even so, we had not fully caught our stride when the armistice curtailed further hostilities; and yet further that our toxic chemical program, for the field, had been constructed upon an aggressively forward-looking scale. But mark you—in spite of all the advantages that had

[4] Valuable data concerning Edgewood Arsenal will be found in *Journal of Industrial and Engineering Chemistry*, January, 1919.

accrued to us by reason of delayed entry, in spite of the fact that our gallant Allies had borne the major portion of the load and that, too, in its most acute and distressing form, yet even so our excellent solution of the problem, when viewed in contrast with the marvelous productive machine of Germany, was both tardy in adequate productivity and enormously expensive in development.

A somewhat tolerant and indulgent concern is felt for those whose *dolce far niente* attitude has inhibited them from interesting themselves in the grave import of this problem—for those likewise whose minds become bewildered in the concentrated effort required to master the significance of a highly complex and enormously expensive situation. For such the brief consideration of a minor detail may prove helpful. This is rated a minor detail advisedly for, without minimizing the vital importance of a thoroughly satisfactory protective gas mask, it must (in all fairness) be conceded that gas mask production is relatively but a minor factor in the huge toxic chemical problem. Allusion has already been made to the fact that type after type were developed in the effort to secure adequate protection against the various new toxics which were employed from time to time. It has been estimated by General Hartley that Great Britain produced 19 million box respirators—and of all types a total of 50 million. While discussing minor details a speculative thought may merit consideration, and may further indicate how vast issues are frequently found to pivot upon comparatively insignificant facts. It was a far cry from the destructive projectiles of the famous 42-cm. howitzers of the early Belgian offensive to the impalpable atoms of the diffusible toxics of the later campaigns. Nevertheless these impalpable atoms necessitated a defensive technique far more expensive and extensive than that suitable for their gigantic progenitor. As is doubtless well known, the final British and American masks were of the box respirator type; by contrast Germany avoided the box, and concentrated on the hog-snouted face masks, thus eliminating the weight, inconvenience, and additional expense of box and connecting tubing. Both types employed a layer of filtration material. All filtration media involve the factors of permeability and resistance, and these factors are dependent on character of substance employed, density of the layer, and square area of permeability. Developmental changes in chemical warfare compelled radical alterations of permeability, likewise square areaage and weight. This was readily met by the Allies' box respirators; not so with the Teutonic hog-snout, for its maximum of filtration had been attained. It is the

mature belief of certain thoughtful minds that with a continuance of hostilities, and the ever-increasing use of Blue Cross Gas by the Allies that Germany would have been compelled to adopt the box type respirator. Now the box type requires a flexible tube connecting the face mask with the filtration box. Of all known substances there is none that can compare with rubber tubing for such purposes. It is beyond peradventure that the available rubber stocks of Germany were absolutely inadequate to permit this wholesale use of rubber, hence likewise of the box respirator—hence finally of absolutely essential and adequate gas protection. In the light of the foregoing, the superficially quixotic but essentially and basically sound postulate is submitted, that it was but a question of time before the rubber shortage of Germany would have proved a determinant factor in capitulation.

Possibly a word regarding the effectiveness of toxic chemicals will prove stimulative. In the early days, between May and July, 1915, before chemical warfare had assumed its later and more effective types, the Germans made three attacks upon the Russians west of Warsaw. It is recorded that these three attacks totaled not more than an hour, on a front of some 6 miles, with the result, 5,000 dead and a casualty list of 25,000 officers and men. A Siberian regiment, whose ration strength was 40 officers and 4,000 men, lost 90 per cent, leaving but 4 officers and 400 men. Under present conditions there is no type of offensive so highly destructive and so comparatively inexpensive as toxic chemicals—this against unprotected troops. The further thought is stressed that a mask quite satisfactory against certain gases may be wholly inadequate against other gases of new type employed as a surprise; the destructive effect upon such mask protected troops is essentially the same as though wholly unmasked.

IV

The comparison has been frequently and bitterly drawn between the unimpaired territory of Germany, fair and justly lauded in song and story, filled with its usual prewar productive activities, and the shocking wreckage of the occupied areas of Belgium and France. It is hardly probable that in any other field of industry is this contrast more conspicuously notable than in her far-famed, long-standing, highly organized, admirably equipped and abundantly productive synthetic dye industry—the very industry that properly and profitably produced peace-time products during peace time, but which, over night, was transformed, without confusion,

without expense, without delay, into the source of supply of the most dependably destructive of all war-time agents. So far as known the synthetic dye industry of Germany has been fully diverted back into peace-time channels, and its products again are normal, reasonable, proper, and profitable, as of yore. There is every reason to consider that the Interessen Gemeinschaft is larger and more productive than before the war, that it has gained a wealth of experience and a vast amount of experimental and practical knowledge as the result of the war; and yet, if the Interessen Gemeinschaft demonstrated its destructive efficiency during the World War, this identical destructive efficiency (but substantially augmented by World War experience) exists today—a potential engine of death, an incalculable strategical asset to Germany, a world menace of the first magnitude.

The question may well be raised and the charge submitted that needless commotion is being developed over a situation of no great import, that (for example) even admitting the foregoing facts, the synthetic dye plants of other countries are sufficiently numerous and otherwise capable not only in supplying all the proper and usual demands of each country, but that, in addition, when taken in the aggregate would exhibit so vast a productive volume that the entire Teutonic output would be negligible. Why, therefore, forsooth, such a tempest in a teapot? Why endeavor to develop a national militaristic attitude? Why agitate ourselves regarding these dead-and-gone things—the fretful annoyances of dead-and-gone yesterdays?

Surely in this presence it is unnecessary to submit defense against the fantastic charge of a propaganda of militarism. The spineless proponents of "peace at any price" are ever wont thus to assail any dispassionate analysis of a problem that vitally affects the welfare of the Commonwealth and in addition, perchance, may necessitate a modest tax upon their personal resources.

But the question of the available world productive capacity of synthetics *vs.* the demonstrated productive capacity of the Interessen Gemeinschaft is in truth a question that merits thoughtful consideration. For if it is reasonably certain that any one country has a peace-time synthetic productive capacity comparable with that of the Interessen Gemeinschaft, that particular country enjoys independence and freedom from anxiety; or if any group of countries total a productive capacity for synthetics comparable with that of the Interessen Gemeinschaft, that group of countries enjoys independence and freedom from anxiety.

The following statstics will present certain illuminative facts:

	1913 *Dye production* (*tons*)	1913 *Dye home consumption* (*tons*)	1918 *Dye production* (*tons*)
Germany.....	135,000	20,000	135,000*
Switzerland.....	10,000	3,000	12,000
France.....	7,500	9,430	18,000
United Kingdom..	4,500	31,730	25,000
United States....	3,000	26,020	27,000
Other Countries..	3,000	72,820	4,000
Total Non-Teutonic Nations...	28,000	143,000	86,000†

* Probably more.

† Lefebure: "The Riddle of the Rhine."

It is regretted that time has not been available for securing more recent estimates; but even so the conclusion is inevitable that prior to the World War Germany produced 135,000 tons of synthetic dyes against a world total of 28,000 tons; that at the same time she utilized for usual home consumption only 20,000 tons against a world total of 143,000 tons; that in 1918 Germany produced not less than 135,000 tons against a world total of 86,000 tons. The Teutonic synthetic excess over the world, on war-time production basis, in 1918 (when the Allies had strained every nerve to develop abundant chemical productivity) was easily 57 per cent. When we remember that the vast bulk of the chemical plants of the non-Teutonic world in 1918 were nationally subsidized (rather than the normal peace-time commercial plants of Germany) to be construed as an emergency manifestation of war-time stress, we are not to be denied the belief that, unless these various plants have either been maintained at maximum by the respective governments or taken over by capable commercial organizations, *Teutonic chemical dominancy is not only as of yore, but is actually, today, far in excess of that noted in 1918.* As the result of his comprehensive survey, Lefebure, in 1920, estimated that the Interessen Gemeinschaft was ready at short notice to produce 3,000 tons of toxic gas per month, and that in a trifle over one day it could deliver shells equal to the entire stock authorized to Germany by the Treaty of Versailles.

The foregoing digest of an exceedingly important and exceedingly complicated problem is admittedly but a surface survey of the most fragmentary character, but the following would seem to be reasonable conclusions:

1. For many years prior to the World War Germany, with the greatest skill and most indomitable energy, developed a synthetic dye industry of such magnitude that it fully supplied not only her own needs but afforded a huge surplus for foreign consumption.

2. The non-Teutonic world purchased freely the synthetics of Germany, and manifested a notable disinclination toward building up an adequate synthetic industry in wholesome and legitimate competition.

3. Thus prior to the World War Germany maintained an essential world monopoly in synthetics.

4. During the World War the Interessen Gemeinschaft was diverted from peace-time production to war-time toxics; this was accomplished readily, without appreciable expense, without noticeable delay.

5. Thus Germany maintained in war what she had achieved in peace.

6. Subsequent to the war Germany has maintained her pre-war control of synthetic production.

7. Her possession of synthetic control not only grants her commercial advantage but also affords her an incalculable military advantage.

8. Much has been accomplished in regulating military equipment among the nations, but so far as is known, nothing (of any significance) has been accomplished in curbing the activities of the Interessen Gemeinschaft.

9. The synthetic dominancy of Germany constitutes a world menace of the first magnitude.

10. In spite of our excellent efforts during the World War the United States is not, today, the productive peer of Germany.

11. The world menace in synthetic production is therefore a menace to the United States.

12. Article 170 (Treaty of Versailles) prohibits the importation of munitions of every kind into Germany, while Article 171 forbids the manufacture of asphyxiating gases and analogous materials in Germany.

13. So far as is known those responsible for the execution of the disarmament clauses of the treaty have not manifested a clear comprehension of the synthetic dye menace of Germany, nor imposed and enforced suitable restrictions of adequate character.

V

As above noted, German peace-time synthetic productivity, far in excess of that of the United States, constitutes an ever-present potential menace to the United States; and, unless adequately evaluated and adequately provided for, likewise constitutes a vulnerable sector of extraordinary importance in the National

Defense Policy. Brief discussion has already been made regarding the Edgewood Arsenal.[5]

The Edgewood Arsenal, even though operated at full capacity is neither the adequate nor the proper solution of the synthetic chemical problem. Not until there is developed in the United States a chemical industry comparable to that of Germany shall we be freed from the ever-present commercial supremacy of Germany, and the ever-present potential toxic supremacy of Germany on war basis. It may be fairly assumed that the War Department views this problem with serious concern; and, so far as authority has been granted by the Congress, has done all within its power to develop and maintain chemical warfare official and production cadres. But it must also be scrupulously noted that throughout the country there is widespread ignorance (based largely upon widespread indifference) concerning this grave national problem.

VI

The National Defense Policy is but the manifestation in concrete form of the will of the People, expressed by and through the Congress. If the policy be shown to be both strong and comprehensive, it argues a fundamental soundness and keen sense of patriotic responsibility on the part of the Commonwealth. If, on the contrary, the policy is shown to be weak, or even though strong and comprehensive it be given scant consideration, inadequate appropriations being granted for its full functionation, largely determined by frequent destructive criticisms appearing in the press, in political campaigns, and on the floor of the Congress—such will clearly demonstrate an essential and fundamental weakness in the American psyche, or (by the most charitable and lenient construction) a supine and fatuous indifference to the lessons of the past, and to the impending dangers of a future heavily freighted with dark and threatening portents. The National Defense Policy for good or for evil, for victory or for defeat, for weal or for woe, is but a manifestation of the national psyche.

VII

In view of the fact that the most important factor in the question of disarmament is the chemical factor; that by an extraordinary, indeed an inexplicable, coincidence, this factor has received

[5] In a recent personal communication from Colonel Gilchrist and Colonel Brigham (respectively Chief and Executive Officer, Chemical Warfare Section, War Department), it is stated that the Edgewood Arsenal is still under the control of the War Department with its productive output reduced to the minimum. For the present, at least, dismantling seems not to be contemplated.

the least consideration; that much attention has been devoted to questions of armies and navies, to aerial dominancy, and submarine supremacy; that the Treaty of Versailles has been completed, the League of Nations has been created, and international disarmament measures have been entered upon; yet the most insidious and most deadly of all menaces has been granted a merely prefunctory consideration. The "Scrap of paper" phrase awakens repulsive memories; but may it not well be true that we are in frank danger of developing international combinations and agreements so devoid of adequate measures of control, so ill-equipped with punitive powers, that their net effectiveness, when subjected to the crucible testing of impending conflict, will have a similar measure of inadequacy.

It must be clearly recognized that neither the pronouncement of a national edict nor even the agreement of Leagued Powers will suffice to control, curb or nullify future chemical warfare. That it is (of all current types of offensive agents) *sui generis* and unique, in that perfectly legitimate sources of perfectly legitimate peace-time necessities may, at a moment's notice and along lines already carefully and exhaustively predetermined, transform their harmless, indeed beneficent peace-time products into the most toxic type of offensive agents. Furthermore, that while on the one hand an amplification of the sources of these beneficent peace-time products is not an unreasonable policy or procedure, yet this very amplification (in and of itself reasonable and beneficent) makes for a notable increase of potential offensive effectiveness the moment that war is declared, or even held to be possible or pending; and yet further that the maintenance by any one country of a notable preponderance of chemical productivity, in direct proportion bestows on such a country a marked offensive dominancy. Nor is the final link in this chain difficult of discernment—that the casual, or careless, or bland ignoring by any group of nations of the chemical dominancy of any one nation but spells catastrophic disaster for these high priests of *laissez-faire*.

For the present, at least, no substantial assistance or cooperation need be anticipated from our late Allies, nor does it seem probable that the League of Nations, in the near future, will exert any critical supervision or compelling control over the Interessen Gemeinschaft. Our salvation, such as it may be, must be autogenous; and the sooner that this fact is widely recognized the better for the Commonwealth. The following postulates should commend themselves to thoughtful and patriotic minds:

1. The U. S. Government should be steadily supported in strict enforcement of the present National Defense Policy.

2. The War Department should be supported in executing the details of the National Defense Policy.

3. Edgewood Arsenal should be maintained in good repair, and ready for all possible emergencies, with a personnel of adequate size and character.

4. The War Department should acquire and maintain suitable reserve stocks of basic materials, should establish satisfactory liaison with the sources of supply of basic materials (for future emergencies), should establish satisfactory liaison with commercial production plants.

5. The War Department should issue commissions in the Reserve Corps, and offer proper encouragement to research chemists and production experts to apply for commission.

6. Individual and community encouragement and financial support should be accorded synthetic dye production plants of commercial type.

7. Resistance (of appropriate character) before the Congress should be made at all times whenever the insidious and plausible apostles of National opportunism assail the National Defense Policy, the Army, or the Navy, attempt to discredit their lawful execution of the laws of the Commonwealth, or to curtail or eliminate proper appropriations for their adequate execution of such laws.

8. The constant stream of disruptive and disintegrating propaganda appearing in the press, on the platform, on the streets, wherever and whenever men do congregate, should be met by a counter-attack by patriotic minds, that the integrity of the Commonwealth be maintained against the enemy (from without) and the traitor (from within).

9. To accomplish the foregoing an intelligent conversance with actual facts is essential, the spirit of self-sacrifice and service is essential, a firm stand for constructive and protective measures of national preparedness is essential; these duties rest imperatively upon you and upon me, for this is our country.

TACTICS—THE THERAPY OF WARFARE

By Colonel GUSTAVUS M. BLECH, Chicago, Ill.
Medical Officers' Reserve Corps, United States Army

IN THE many years that have passed since the writer landed on the hospitable shores of these United States as an immigrant, whose entire English vocabulary could have been written on a postage stamp without great effort, he remembers and often is reminded of his first visit to a baseball game.

Knowing only that it was a sort of open air game with athletic propensities, he accepted a friend's invitation to attend the national pastime with some misgivings. The game proceeded about as noiselessly as many games we have seen since, but when our friend became so enthusiastic that he repeatedly landed his vola manus on our vertebral column, we dutifully inquired into the cause of his exuberance. "Home run, you fool, home run!" he exclaimed. "Good, fine, suits me perfectly; let's run home," we replied.

It is only a very few weeks since that this incident of our early Americanization period was vividly recalled, only that the scene had somewhat changed, sufficiently so to cause any real American to do a little serious thinking.

Instead of a baseball field, the scene represented several square miles of land in the sovereign state of Michigan. Instead of a lonely foreigner, who never had been explained even the elementary rules of the game of baseball, we behold a number of native Americans, garbed in the uniform of medical officers of the American Army, less than four years after their demobilization from the most tremendous war known to history, instead of a mere visitor, these gentlemen were supposed to participate in a game which their garb indicated to be peculiarly their own, yet all they did know was to translate "home runs" as the psychologic time to "run home."

To put the matter concretely let me narrate in my own way what it is all about. It will do us all a lot of good, because soon the warm weather will be a matter of the past and during the cool season we can do a little thinking. It will come in handy during the following summer season, and who knows but it might come in handy under circumstances few of us think possible, at least for some time to come.

The story is simplicity itself. The writer received orders to proceed to a two weeks' encampment for officers of the diverse

reserve corps. There was little time for preparation and believing that the whole thing was to be merely an opportunity to get rid of our aldermanic rotundity and have a little mental diversion, all at the expense of Uncle Sam and the next month's rent paid to boot, we traveled light, packing merely the old bedding roll and a handbag into the tonneau of the car.

When we arrived after a mishap or two, we were told that we are very welcome, that there will be no quizzes, exams, theses, conferences or similar wasters of mental energy, and that all that was expected of us was to eat regularly, shave if we felt impelled to keep clean, and come to the camp theater every forenoon and afternoon merely to enable a number of officers who had completed some general staff course or other at Leavenworth, to show off their ability to conduct campaigns on maps.

Five hundred officers, ranking from colonel to second lieutenant and representing every branch of the military service, left the assembly hall after that announcement as happy as boys rid of all earthly cares can possibly be.

Only the knowing ones smiled and felt that there was a hitch somewhere, that Uncle Sam is not going to spend a little mountain of greenbacks merely to please half a thousand reserve officers. I shall at this time say nothing of the encampment itself, though that offered much of interest, except that the officers in charge kept their promise, and yet the instructors had prepared a schedule so cleverly, that while in the very beginning it looked as if they were to do it all, gradually the reserve officers were led into doing a little thinking and studying of their own, and shortly after the officers had limbered up a bit, the lectures were held in the nearby hills and valleys, and instead of diagrams we had the topographic map of the terrain in our hands and the terrain itself before our eyes.

True, there were neither quizzes nor examinations, neither sketching nor written solutions, yet the reserve officers were handed all sorts of problems from day to day, beginning with smaller units and culminating on the last day of the exercises in a full war-strength division opposing another one over a battlefield we had traversed in all possible directions again and again.

The infantry officers, the artillery officers and to a certain extent also the cavalry officers took to these exercises like ducks to water. One could see them during the free hours in and around their tents working on their maps with rulers and pencils, talking over among themselves the various tactical situations and not hesitating to question this or that point in the approved solutions. The quarter-

masters, ordnance officers, finance officers must have felt as did I when I first saw a ball game, but I am not concerned with them, for, after all, their work requires little in the way of tactics. But when it comes to my immediate colleagues it is a different matter, for a field medical officer absolutely must know something of tactics, or, heaven knows what may be the result of lack of familiarity with the most elementary principles of modern tactics.

Let there be no misunderstanding. There were a goodly number of medical reserve officers in the camp, and we met several veterans who knew their business from alpha to omega. They could read their maps like any of the line officers, and what is more pleasing still, they "estimated situations" with a skill which would have caused joy to the most dyed-in-the-wool Leavenworth strategist. But these officers have had previous experience either in the National Guard or else as pupils of the diverse schools, which had been maintained by the Army before the World War. But as regards the lieutenants, captains and majors who had been commissioned during the war—and they were in the overwhelming majority—the tactical exercises could have been conducted in Chinese for all the good it did them.

Mind, they knew that the field hospital companies were usually in the rear, that the sanitary companies normally go up closer to the firing line and that the ambulance companies ply somewhere between both *et voilà tout.*

When the instructors led the medical officers as a separate group, their interest was aroused to the utmost and they tried to follow the tactical reasonings affecting the diverse sanitary units in action, but when several groups were united and the problems dealt with combat tactics they studied the configuration of the sky.

These medical officers keenly realized their shortcomings as far as the encampment itself was concerned, but repeatedly told me that they cannot possibly see the necessity for familiarity with battalion and regimental problems, with the question of when to utilize the reserves, when to attack and when to await attack, the use of light and medium artillery and so on. That, to their way of thinking, was the business of the battalion, regimental and higher commanders and not of medical officers, whose duty it was merely to look after the sick and wounded in battle.

That this statement was not the product of their innermost conviction is evidenced by the fact that, shortly after this conversation, a number of seriously minded young colleagues began to realize that, in spite of the fact that they were authorized to wear several battle

clasps on their Victory medal, they evidently lacked in some essentials required of military medical officers.

These same gentlemen did me the honor of asking me to answer a number of questions, to which they sought definite replies. These questions convinced me that to them, as to many others without previous instruction of a suitable character, the word *tactics* implied some obscure, mystic study, something of a *bête noir*.

Their questions gave me food for thought and in the following I will repeat their interrogatories and my replies, rearranged merely to overcome the usual defects of impromptu discussions.

1. WILL THERE BE SUFFICIENT OF A DIFFERENCE BETWEEN THE NEXT WAR AND THE WORLD WAR TO RENDER THE EXPERIENCE GAINED DURING THE LAST CAMPAIGN OF NO MILITARY VALUE?

A categoric reply to this question is impossible for any man without prophetic gifts, since, after all, a situation similar to the one we encountered during the World War, is not beyond the possibility of repetition. The probability of war must always be borne in mind. Speculation when and with what nation our next war will be, is idle, for the nation believed to be a potential enemy, may prove one of our most loyal allies, while a nation with whom we are today on the best possible terms, may, in the course of time, prove a bitter, military and political antagonist. Those officers, naval and military, whose duty it is to see that our nation is not caught napping, no matter at what hour and by whom jolted by a declaration or an act of war, are considering every possibility, but for us, who at best will play minor roles in the next conflict, it is essential to know that the best possible military defense is a bold attack, and to prepare accordingly.

But it must be remembered that when we say "attack" we do not mean it as it was understood in some sectors of the front in France, for there, for some time previous to our entry into the world conflict, the war had assumed the stability of a position war, with virtually permanent trenches, dugouts, command posts and the like, while our plan must be and is to attack rapidly, and that means that we must not only possess great mobility, but that we must not allow the enemy sufficient time to take the best possible advantage of such shelter and military protection as may be available through the configurations of the terrain or man's handiwork (hills, strongly built houses, woods, quarries).

Now under such conditions, war will differ in a tactical sense

from what most of us have seen and learned in France. The great mobility, the rapidity of advance and the purpose to strike as fast as possible and as hard as possible, affect the tactics not only of the larger units but of the smallest tactical units of interest to medical officers—the battalion, and these will be at great variance with the methods of combat in 1918 and 1919. From this it must not be concluded that the experience then gained is entirely valueless. When officers and men become familiar with organization, military nomenclature, the manner of conducting military marches, bivouacs, encampments, billets, the use of the implements of modern warfare, and, as far as our own service is concerned, the conditions under which we work in the field, they have the military foundation for tactical study.

So-called open warfare is apparently a very complicated affair. Everything is complicated as long as we are not familiar with little details. The amateur has a big job on his hands learning ordinary photography, a matter of amusement to the initiated, but he who makes up his mind to learn all there is to be learned for the sole purpose of being able to turn out good pictures, will soon find out that his imagined difficulties were not at all the mountains they at first appeared to be, but common, every-day obstacles, easily overcome by a little use of gray matter. What applies to amateur photography applies to all disciplines. Depending upon whether you desire to become professional experts or merely experienced and skillful amateurs, you will increase or decrease the expenditure of energy. You have the foundation, you know at least what a kodak looks like, how it acts under certain conditions. This you do not have to be taught any more. Now when it comes to focussing, exposure and developing the films under all conditions of light and weather, you need more knowledge and some practice.

Translate the word photography to read "combat tactics," and you have my reply. Your experience during the World War is a valuable asset, but insufficient intelligently to participate in open warfare, even as subordinate medical officers.

II. IS THE KNOWLEDGE OF COMBAT TACTICS ESSENTIAL TO MEDICAL OFFICERS AND, IF THIS BE ANSWERED IN THE AFFIRMATIVE, THE REASONS WHY?

There are two classes of medical officers, those serving with combat troops in the field, and those serving with hospitals, laboratories, supply depots and the like in the zones of the rear. The latter class can be eliminated from our consideration, since all they are required

to perform is professional or administrative duty. They are not supposed to come anywhere near the enemy and their usefulness from the standpoint of military efficiency in war is restricted to relieving frontal sanitary units from certain burdens and to supply them with professional material, scientific information, etc. Their military value, as compared with like civilian help, is through their functions as organized agents for human salvage. Now when it comes to the medical personnel serving with the diverse combat units at or near the front in the sense of the actual firing line, their strictly professional and administrative duties are so militarized to fit into the scheme of frontal military organization and function, as to almost lose their identity as technical or professional troops, at least just enough to have the strictly military character of their service become predominant.

One thing remains of paramount importance and that is—mobility. You note that hospitals in the rear have enormous quantities of beds and professional equipment, which, in the event of a change of location, it would require days, if not weeks, to pack and load for transportation.

But when it comes to the sanitary detachments assigned to battalions and regiments and to the diverse companies of the medical regiment, you will note that the equipment of these field sanitary units can be nested or packed and placed on their own trucks or carts in a few minutes. Why? So that in the event of a rapid forward movement the medical units can accompany the battalions or remain in proper contact with them, and, on the other hand, if the fortunes of war make it necessary to withdraw rapidly, that they can continue to serve the retreating troops and themselves avoid being captured by the enemy.

Considering the uncertainty of all battles for some time, until one can tell what the outcome is likely to be, the medical officer responsible for a field sanitary unit, big or small, must be able intelligently to estimate battle situations in order to make the proper disposition of the personnel under his immediate supervision. While it is true that the line officers, and especially commanding officers, will be glad to give the medical officers all the advice they can, they may be so busy with troubles of their own, especially during the progress of a battle, as to be beyond reach or else in no frame of mind for minute explanations. The responsible medical officer must be able to estimate situations himself in order not to remain inactive when most needed, or precipate matters by too early activity. While the tactical problems of an infantry

battalion are almost elemental, as far as interpreting tactical situations of the battalion itself are concerned, the medical officers of the ambulance and sanitary companies must be able to interpret military orders, and by interpretation is meant not a mere reading of what is sent them from higher authority, but the execution of orders in an intelligent manner. Granted sudden and unexpected changes in battle situations, a medical officer in charge of a sanitary field unit cannot justify failure to be where he actually should be, because he obeyed orders literally and implicitly. The time that a soldier who won a battle by a movement not directed in the battle order is given all honors for bravery and ingenuity only to be court-martialed for disobedience may have actually been, since many anecdotes are handed down from periods when kings and field marshals were sticklers for blind obedience, but such conceptions are as superannuated as the belief in witchcraft or alchemy. We Americans believe that the gray matter in our skulls needs occasional exercise without official direction to that effect. Sanitary tactics being entirely based on combat tactics, one cannot lead sanitary troops with any degree of effectiveness, unless all such tactical moves fit into the general or combat military plans and situations. If you aspire to lead and not merely to apply a splint or dressing, with a senior medical officer directing you when and where to do it, you will study infantry tactics first and then become familiar with sanitary tactics.

III. WHICH IS THE BEST MEANS OF FAMILIARIZATION WITH COMBAT AND SANITARY TACTICS?

There is no easy road to success, there are no axioms which can or should be memorized, there is no single textbook or monograph that can perform the metamorphosis of even a careful reader into a tactician, and yet nothing in the way of education is easier to acquire than a sound conception of tactics, the only two conditions being an average general education and the will to know.

Assuming that every physician has the required educational qualifications and the will, but a little time, say a year, should suffice to provide for our country a corps of reserve medical officers sufficient in size for any war of magnitude and efficient enough to cope with any and all military situations.

There is no fixed way by which the required knowledge and skill can be acquired. The printed word and the map are of tremendous help, provided both can be visualized not as mere sentences and lines and dots, but as actual human beings fighting with real

weapons over terrains, such as every man who has traveled beyond the confines of a town or city has seen, struggling for military supremacy, inflicting and sustaining losses in personnel and material.

The printed exercise and the large-scale military map are excellent means of instruction, provided one does not fall into the error of imagining the map and the exercise to be the inflexible law to be followed implicitly on all future occasions.

Tactics is not only a science but an art, and many of the greatest generals have been comparatively poor students at their respective military academies, while many more have never seen the inside of a military school.

You heard as medical students a lecture or two on pneumonia. Your professor gave you a good idea what the disease is like and how to treat it. After your graduation you have refreshed your mind on many an evening by poring over the pages of some standard textbook. You acquired in that manner a lot of knowledge, yet when you are confronting at the bedside a man gravely ill with pneumonia, you are not going to treat him according to page so-and-so of your textbook, nor will you consult your lecture notes. What you will do, is to watch the case as it progresses and you will utilize such of your many resources as your judgment dictates.

Substitute the word "tactics" for "pneumonia" and you have the solution of your military problem.

But, say you, the application of the simile is not quite clear to you, because through attendance at school and subsequent studies and clinical training you became familiar with the essential problems pertaining to the diagnosis and treatment of pneumonia, and, because when it comes to the subject of tactics you scarcely even know the meaning of the word.

You are right, absolutely so, and the only answer to all that is to acquire the principles and elementals pertaining to tactics, and I am going to give you a few hints how to go about it successfully.

Mind, I am aware that there must remain a difference between the amount of time and energy you put in to perfect yourself in your profession, which is your life work, and that devoted in the interest of what at best will be only a temporary vocation, in other words, you cannot be expected to devote more than your spare time for an art in which you must, as a matter of circumstances, play the rôle of an amateur.

But before we proceed let us first agree on what you and I mean by the expression "spare time."

If you mean by spare time your readiness to bring the "tre-

mendous" sacrifice of giving up an hour or two every other Sunday or so, my answer is that you have no interest in your country, which you were assumed to have when you accepted a commission as a medical reserve officer, and you ought to be honest enough with your country and yourself to send in your resignation, frankly stating that you made a mistake when you made application for membership in the Army, for the simple reason that you have acquired a military grade which you will never be able to fill creditably, should war come—and come it will—unless you are specializing and have made it clear that you are to function in a strictly professional capacity only.

If, however, you take your military commission as a trust and are willing to untilize every spare evening to devote yourself to the study of your future duties, then you are the right man in the right place and you are, everything else being favorable, as sure of success as we mortals can be of anything in this world.

Now, most of you have had, as already alluded to, advantages. You have seen something of our Army on a war footing, you know something of the function and cooperation of the diverse branches of the service, some of you have been in instruction camps since the conclusion of the war, and it must have dawned on you that we no longer study tactics "made in Germany," but that a typically American atmosphere permeates every theoretical consideration of warfare—and the theoretical is the precursor of the practical—but, for the sake of including that large body of medical officers who have been too busy with their private affairs to go to camps and the younger generation of physicians, who in the not too distant future will take our places, I assume that you are entirely without military experience and I will make my suggestions accordingly.

Again permit me to resume the comparison of tactics with pneumonia. In order to understand pneumonia you must know the respiratory apparatus. The science which teaches you that is—anatomy. The science of tactics has a corresponding branch. It is called organization. Taking a division as the unit of special interest, you must learn what it consists of: infantry, artillery, engineers, signal corps, machine gun units, tank organizations and so on. Knowing the respiratory apparatus anatomically not being sufficient to understand its diseases, you study physiology to know its normal function. You will have to know the function of every branch of the military service, for example, that the infantry is numerically the largest branch of the division, that it is the principal force necessary to attain victories in war, that it functions by getting at the enemy and demoralizing him through the use of rifles,

pistols, automatic rifles and so on, that the artillery is a supporting force, paving the way for an infantry advance and supporting its work, that the engineers normally are the mechanics who build roads, bridges, field fortifications and the like, that the signal corps provides intercommunication through wireless, telegraph, telephone or visual appliances, etc., etc.

Just as in disease the anatomic and physiologic normalcy undergoes unaccustomed changes, terminating in permanent defects, regeneration, recovery or death, so does the living and functioning military organism in war undergo changes. There are partial losses, limbs may be temporarily crushed or completely severed, there may be congestion in one section and ischemia in another, and the military doctor—the officers—must know the proper remedies to bring about an amelioration of conditions and to prevent death of the organism.

This is accomplished through tactics—the therapy of warfare.

There is something else that must be considered before coming down to brass tacks. In our profession we have everyday ample opportunity for the solution of real problems, since disease and suffering is an every-day occurrence, but the military man has a chance at his profession rarely oftener than once in fifteen years, from which you can easily conclude that his training must resemble somewhat the training you had in obstetric work before you were allowed to attend the lying-in chamber—the manikin.

Just as the manikin could not simulate for your benefit post-partum hemorrhages, eclampsia, contracted pelves and the like, but, inspite of these shortcomings, afforded you some means of becoming familiar with version and extraction, so can the best military "manikin" not replace war, since in all practical exercises casualties of war are out of the question.

But what is this military "manikin"?

Tactical exercises in the field with actual troops, technically known as a military maneuver.

Tactical exercises in the field without troops, technically known as terrain exercises.

Tactical exercises without troops and without the use of actual ground, but by having the ground represented on a plot, pieces of paper, blocks or pins to replace military units, technically known as map exercises.

I have mentioned the three methods of instruction in their order of importance, but I am convinced from my own experience, that it is best to reverse the order for systematic instruction.

Of course to appreciate map exercises the map to the student must be a real plot, at least to that extent that he must be able to visualize the actual ground it represents. This is the first and most important step in any military education. It is easy or difficult, the personal element playing an important rôle. It takes practice and, what is more, it requires no individual teacher and is a more useful and more pleasurable exercise than golf.

If you select any one of the many books on military map-making you will acquire all the knowledge needed about direction, distances, roads, streams, woods, etc. As most of you have used road maps for your automobile trips this is no longer a serious problem. But when it comes to the configuration of the ground, the actual appearance of hills, valleys represented on military and topographic maps by irregular lines called contours, you may have the best explanation, exemplified by models and what not, and the only way to learn their interpretation and to actually visualize them as real ground is to take a good large scale map of a hilly section of the country, visit it and spend a few hours, map in hand, studying the ground. Contour lines will soon have a real meaning to you, so that when you get a hold of a map, the piece of paper will convey to your mind actual ground. I have never been either in Gettysburg or in Fort Leavenworth, yet I can see these maneuver terrains just as clearly as if I had been there. True, when I get there the landscape may not be just what I imagined, the grass may be of a less greenish hue and the parade ground and the river border may have little characteristics which the map does not consider, but these are non-essentials. Placed anywhere on the ground with my map, I would find my way about in the dark. You can attain all that with a little effort, say by one or more Sunday trips to a neighboring country with undulated ground.

The government provides correspondence courses for reserve officers. It is earnestly recommended that all reserve officers except those who know the game from alpha to omega, apply for enrollment. It will require a little time and labor but you will be grounded in all subjects and eventually get to tactics.

The method is a bit slow and laborious, it must be admitted, and if rapid results are desired you have other resources.

Address a simple letter to the Book Department of the General Service Schools, Ft. Leavenworth, Kans., asking for their catalogue and for the two following pamphlets:

1. "Estimating Tactical Situations and Composing Field Orders," by Roger S. Fitch.

2. "Some Notes on the Solution of Tactical Problems," by H. B. Fiske.

These two pamphlets will cost you the munificent outlay of forty cents which you must prepay.

For these forty cents I promise you two mental feasts, and, what is more, something like a cloud will be lifted and you will see the first sun rays piercing the veil of tactical mysteries. Read Fitch first. It will require only one evening. Read Fiske the next evening. Both writers try to explain tactics, and they do it well and in a language which even a high school boy should find no difficulty in following.

Your appetite whetted for real food, send to the Book Department for "Studies in Minor Tactics," a handsome little volume costing less than a dollar. By the time you have become familiar with the fact that this little book contains tactics of the three arms and that the medical service has come in for special situations, you will send for large maps, historical books and special books and after a few weeks of earnest study, you will not be content to be a mere captain, major or colonel, but your tactical aspirations will see you in imagination commanding divisions, army corps and, finally, you will soar with the Napoleons in the problems of strategy, politics, international law and economics. You will find the way to all this without a guide. I have shown you the main road. Follow it—you will not lose your way.

COMMENT AND CRITICISM

THE THIRTY-FIRST ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES

The 31st Annual Meeting of The Association of Military Surgeons was held at the Medical Field Service School U. S. Army, Carlisle Barracks, Penna., on October 4 to 6. The meeting differed from former meetings of The Association in that there were no papers read other than those presented by two distinguished foreign delegates. The entire time was given up to practical demonstrations of new medical department equipment and a problem dealing with evacuation of the wounded from the firing line back to and including the field hospital. A most instructive demonstration was given by Chemical Warfare Service.

The meeting was attended by more members and guests than any meeting The Association has held in many years and all present were delighted with the entertainment provided by the Commandant and Officers of the Medical Field Service School. The ladies of the post had a number of entertainments for the visitors and their ladies which were very enjoyable. It was found impossible to give an account of this meeting in this number of The Military Surgeon but the greater part of the December issue will be devoted to the proceedings of the meeting, giving in detail description of the apparatus demonstrated, the field problem and its solution and the addresses made.

CURRENT LITERATURE REVIEWS

Beginning with the next issue of The Military Surgeon there will be included in each number a list of the articles that appear in the leading medico-military journals of the United States and foreign countries. The more important of these articles will be abstracted. Abstracts will also be given of certain articles of special interest to readers of The Military Surgeon which are published in medical journals as well as the journals of the other branches of the military and naval services.

INTERCHANGE OF HEALTH OFFICERS IN THE UNITED STATES

An event which may be fraught with far-reaching consequences for world health is the Third General Interchange of Health Offi-

cers arranged by the Health Section of the League of Nations which is now taking place in the United States.

Representatives from France, England, Italy, Russia, Poland, Spain, Holland, Belgium, Greece, Jugoslavia, Germany, Switzerland, Norway, Mexico, San Salvador, Brazil, Chile, and Canada, delegated by their respective governments to participate in a course of study and observation, arrived in America the first week in September and will remain for approximately three months. Until September 22 the delegates will remain in Washington, studying national health organization as administered by the United States Public Health Service. Following the close of the course of study of the national health agency the delegation of visitors will separate into three groups, one of which will proceed to Virginia, another to North Carolina and a third to Alabama, where about three weeks will be spent in studying state and local health departments. Richmond, Virginia; Raleigh, North Carolina, and Montgomery, Alabama, are the southern cities which have been selected for study. From there the groups will proceed to Massachusetts, New York and Pennsylvania, respectively, for the purpose of studying the health administration in three northern states and small cities. Syracuse, New York; Allentown, Pennsylvania, and one of the smaller cities of Massachusetts yet to be designated, will be visited for a short period. Following this the groups will make a study of health administration in three of the large cities of the east, namely, Boston, New York and Philadelphia. Present plans call for a reassembling of the entire delegation in Washington late in November for a final conference.

The present group numbers among its members many of the most eminent sanitarians of the world. France is represented by Dr. L. Aublant, Inspecteur principal des Services d'hygiene, Dep. de l'Herault; and Dr. F. Bussiere, Directeur des Services d'hygiene de Montlucon. England is represented by Dr. Thos. Carnwath, D.S.O., M.D., Ministry of Health, London S. W. 1; and Dr. Chas. Porter, M.D., M.O.H., St. Marylebone, London. Italy is represented by Dr. F. Piccininni, Ufficio sanitario de Porto, Napoli. Russia is represented by Dr. S. Slonewski, San. Epid. Bureau (2 Malyj-Tcherkassky Perenlok), Narkowzdraw, Moscou; Dr. A. Marzeew, Chef de San. Epid. (Lechnologiczskaja Ulica), Narkowzdraw, Kharkof, Ukraine; and M. Voeykoff, Sanitary Engineer, Narkowzdraw, Moscou. Spain is represented by Dr. R. Fernandez Cid, Inspecteur provincial de la Santé publique, San Sebastian. Holland is represented by Dr. D. J. Hulshoff Pol, Inspecteur gouverne-

mental de la Santé Publique, La Haye. Belgium is represented by Dr. van Boeckel, Directeur du Laboratoire de l'administration de l'Hygiene, Bruxelles; and Dr. Ensch, Chef de Service d'Hygiene, Schaerbeck, Bruxelles. Greece is represented by Dr. Prigos, Director, State Bacteriological Laboratory, Athens (a.b.s. Greek Legation, Paris). Poland is represented by Dr. J. Batko, Provincial Health Office (Wojewodski Uv ead Zdrowra), Cracow. Jugoslavia is represented by Dr. Ivo Kuhn, Referent du Ministere de la Santé publique, Belgrade. Germany is represented by Dr. K. Sannemann, Port Medical Officer, Hamburg. Switzerland is represented by Dr. J. Hunziker, Chef du Service d'Hygiene du Canton de bale-Ville. Norway is represented by Dr. E. Anderson, Medicin de Prefecture, Lillehammer, Norvege. Mexico is represented by Dr. Enrique Orvananos, Government Inspector of Hygiene, Mexico City. San Salvador is represented by Dr. J. Segovea, Director de Sanidad, San Salvador. Brazil is represented by Dr. Vasconcellas. Chile is represented by Dr. J. Ducci, of the Faculty of Medicine, Santiago de Chile, and Dr. C. Mayers, Director, League of Social Hygiene, Santiago. Canada is represented by Dr. M. M. Seymour, Med. Deputy Minister of Public Health, and Director of Venereal Disease Control, Saskatchewan.

The delegation is accompanied by Dr. Norman V. Lothian, of the Health Section of the League of Nations. Surgeon General Hugh S. Cumming, of the United States Public Health Service, delivered the address of welcome to the delegates.

PAPERS PRESENTED AT THE MEETING OF THE BRITISH MEDICAL ASSOCIATION IN WHICH POINTS OF IMPORTANCE TO THE AIR SERVICE MEDICAL OFFICER WERE DISCUSSED

The following is a report made by Major Edmund B. Spaeth, M. C., U. S. Army, of his attendance at the annual meeting of the British Medical Association at Portsmouth, July 27, 1923, where he presented a paper upon ophthalmological plastic surgery. This meeting was conducted entirely by the medical services of the British Army and Navy in conjunction with the ophthalmological section of the B. M. A. As they may be of importance to Air Service Medical Officers, brief abstracts of papers upon aviation medicine read by Air Commander D. Monro, Wing Commander Clements, Dr. Maddox, Chief of the Air Service Hospitals, and Major Wright, of The Indian Medical Service, are given.

Air Commander Monro emphasized the demand for absolute

visual normalcy, both intra and extra ocular as well as cerebral, in accepting cadets for flying. He advanced several theories as to heterophoria, among the most probable being: Actual changes in the refractive media of the two eyes, not connected with refractive errors; actual variations in the microscopical anatomy of the retina or of the cerebral cortex thus influencing retinal sensitivity or cerebral interpretation of retinal stimuli; and an anatomical, not a refractive error, i.e., anisometropia from differences in the size of the globus oculi. Claim was made that chronic bad landers are almost invariably heterophoric. A brief opinion was given of the manner in which a one-eyed person judges perspective, and the paper closed with a consideration of glare asthenopia. Opinion was given that this asthenopia is caused by, (*a*) fatigue of the ciliary muscle, (*b*) lack of accommodation, (*c*) spasm of accommodation, (*d*) lack of convergence, (*e*) emphasis of any latent or buried heterophoria now manifest.

Wing Commander Clements began his paper with a consideration of the industrial accidents met in civil life due entirely to fatigue superimposed upon a latent or manifest heterophoria or convergence insufficiency. During the war he observed that 70 to 80 per cent of accidents at aviation training camps were due to bad landings and that even with alleged trained pilots this percentage was not much lessened. An investigation of a series of such chronic offenders showed to his surprise that these flyers came from the same stations and trades in civil life which had before the war given the majority of industrial accidents. This impressed upon him the relationship between heterophoria and aviation accidents. The aviator's term "carelessness" he changed to mean "want of attention due to fatigue from a suppressed muscular imbalance." In the treatment of these cases, the first task is to discover the bad habits of the individual, personal as well as those connected with duties, then correct them before any attempt is made to modify the muscular defect through amblyoscopic exercises (Worth's Amblyoscope), prisms and stereoscopic exercises. He quoted several cases in which the procedure was altered and cases changed from moderate exophoria to severe esophoria. He called special attention to the ocular training of pilots who had had a slight crash and in whom certain resistances had to be overcome in addition to the repair of an imbalance. The two tests he used as a check upon examination and treatment are the simple pencil convergence test and the cover test at 20 inches. He thought the latter not only gave a quantitative estimation of the deviation

but also an idea of the recovery power—that is, the rapidity with which the deviating eye returns to fixation. He does not recommend the rotating prism test because it implies an effort or act upon the part of the patient. Instead he uses entirely red and green lenses and charts the deviating eye as,

Under 2 inches from tip of nose	Good
2 to 3	Fair
3 to 4	Poor
Below 4	Very poor

and the response to fixation or recovery as,

1 Rapid
2 Good
3 Sluggish
4 Very slow
5 None

Statement was made that there is but one satisfactory procedure for muscle testing and were he compelled to eliminate all others he would retain only this, the Bishop Harmon Diaphragm Test. His plea for the acceptance of this test was upon the very logical basis of standardization of aviator tests.

A chart was presented on which two curves were platted. One curve showed the "broken line," which was the muscular heterophoria vs. good flying record of 149 chronic offenders, termed "Bad Landers." The other curve showed on the "unbroken line," the same record of 124 pilots without accidents to their records, including one one-eyed pilot, who is still a successful army aviator. The curves charted were in columns A, B, C, D, E, and F, on a scale of 0 per cent to 100 per cent.

A. Pilots without muscular imbalance.
B. with borderline condition.
C. 1 degree heterophoria.
D. 2 degrees heterophoria.
E. 3 degrees heterophoria.
F. 4 degrees heterophoria.

Thus the total number of aviators on the broken or unbroken lines were classified at their percentage height in their class of muscular error column.

The results were as diagrammatically shown below:

Classes	*A*	*B*	*C*	*D*	*E*	*F*
Broken line (%)	1	4	13	18	56	8
Unbroken line (%)	99	1	0	0	0	0[1]

[1] The one one-eyed pilot not counted.

Chart 2 showed the following:

442 candidates all with 6/6 vision.
A Refractive error in plus sphere.
B Number of candidates.
C Per cent of such.

All refractions as below done without a cycloplegic:

A	Nil	.25	.50	.75	1.0	1.25	Above	1.25
B	27	48	113	126	80	33	17	
C	6.8	11.8	25.9	28.1	18.09	7.4	3.8	

In the above chart he attempted to point out that refractive errors when corrected have little relationship to flying, and in his opinion hyperopia was decidedly no bar toward proper flying.

Dr. Maddox discussed fixation and the relationship of a master or fixing eye to aviation, calling attention to the importance of this fact in relation to plane building, as some persons are right blind, others left blind and still others semicentrally blind. He also claimed that the tests for the near were in no wise as important as tests for distance. This is applicable to the phorias. He calls attention to the need for better testing for orientation and distance judging powers in which reaction as well as reflex time are minimized.

Major Wright discussed delayed effects of glare, glare asthenopia, and conjunctivitis, the period of its onset and emphatically stated that glare is at no time a factor after an elevation of 600 has been reached.

Sir John Parsons discussed in detail and at length the importance of studying more carefully the effects of fatigue and centrifugal force upon the aviator. He also spoke briefly upon the acquired color blindness which develops late in glare conjunctivitis, and acquired aviation nightblindness.

WASHINGTON MEETING OF THE SOUTHERN MEDICAL ASSOCIATION

The Southern Medical Association will hold its seventeenth annual meeting at Washington, D. C., Monday, Tuesday, Wednesday and Thursday, November 12-15, 1923. Dr. W. S. Leathers, Executive Officer, Mississippi State Board of Health, Jackson, Mississippi, is president.

This meeting will be made up of twenty sections and conjoint meetings; the programs of these meetings will cover every phase of scientific medicine and surgery. (See marked bulletin for names of sections and conjoint meetings.)

The President of the United States will receive informally the members of the Southern Medical Association and their wives, Thursday, November 15, at 12.30 p. m., at the White House. Of special interest to the ladies will be the reception at the Washington Club on Tuesday afternoon, where Mrs. Woodrow Wilson will be the guest of honor. The usual reception to the president of the Southern Medical Association will be held on Tuesday night at the New National Museum, one of the most beautiful public buildings of Washington, a detachment of the Marine Band furnishing the music. Other special entertainments being received.

At the first general session on Monday night, in addition to the address of the president, Dr. Leathers, there will be an address by Dr. Geo. E. Vincent, president of the Rockefeller Foundation, New York, N. Y.; Oration on Public Health, by Dr. W. S. Rankin, State Health Officer of North Carolina; Oration on Medicine, by Dr. Stewart R. Roberts, Atlanta, Georgia; and Oration on Surgery, by Dr. J. W. Barksdale, Jackson, Miss.

A joint dinner by the Section on Surgery and the Section on Radiology, as well as a number of section dinners, will be interesting features of Tuesday evening. The Alumni Reunions, which promise to be an outstanding feature of this meeting, will be held on Wednesday night, and it is expected that there will be large groups present from all of the leading medical schools.

BOOK REVIEWS

Excursions Into Surgical Subjects, by John B. Deaver, M.D., Sc.D., LL.D., F.A.C.S., Emeritus Professor of Surgery, University of Pennsylvania; Surgeon-in-Chief, Lankenau Hospital, Philadelphia; and Stanley P. Reimann, M.D., Assistant Professor of Experimental Pathology, University of Pennsylvania; Chief of the Department of Pathology and Bacteriology, Lankenau Hospital, Philadelphia. Illustrated. 8°. 188 pp. Philadelphia and London: W. B. Saunders Company, 1923.

The first five of these "excursions" are in reality lectures on surgical subjects delivered by Dr. Deaver at Washington University in Seattle during the month of July, 1922. Of the remaining three, one has already been published in the *Journal of the American Medical Association*, and the other two now appear in public print for the first time. The senior author's name is a guarantee that these lectures gave to those who were privileged to be his auditors the very best of surgical diagnosis, the most modern methods in surgical technique, and—in addition thereto—a rhetorical satisfaction not always characteristic of professional lectures. The subjects with which the individual conferences dealt are as follows:

Peptic Ulcer.
Jaundice.
Diseases of the Bile-Passages.
Trials, Tribulations and Joys of a Surgeon.
Some Surgical Conditions of the Intestinal Tract.

From the foregoing it will be seen that Dr. Deaver did not wholly confine himself to technical matters. The "Trials, Tribulations and Joys of a Surgeon" is partly an historical review of those advances by which surgery has come to its present high estate, and partly an expression of that fine spirit of professional idealism which, encountered in those who have advanced far along the pathway of attainment, offers so much of encouragement and inspiration to the younger man.

It is very fitting that a great surgeon should pay his tribute to Pasteur at a time when the world's medical literature is replete with biographies of that immortal Frenchman. The author quotes from Mr. Stephen Paget's description of Pasteur:

To change the whole outlook of medicine and surgery, Heaven took and trained a "pure scientist," who had never done an operation nor written a prescription; a man who had to screw up his courage even to look at some of the ordinary sights of a hospital—took this non-medical man of science and set him to be head of all the heads of the medical profession, to have them all obedient to his teaching, and proud of the very sound of his beloved name. . . . The whole world is well aware that he has availed more than the physicians and surgeons of his time for its health and happiness. He was set apart from them, that he might be the leader of them; and he led them into that kingdom which they longed for, but could not have found for themselves.

Dr. Deaver then adds a beautiful paragraph from his own pen.

And so on the centenary of his birth and the twenty-seventh anniversary of his death we have gathered here to say words in simple tribute. But

words are powerless, while the child of his genius is still nobly testifying to its truthful conception and fulfilling the highest hopes of an enlightened and enriched science.

A. N. Tasker.

History of the Great War, Based on Official Documents; Medical Services, Hygiene of the War. Volume II, edited by Major Gen. Sir W. G. Macpherson, K.C.M.G., C.B., LL.D., Col. Sir W. H. Horrocks, K.C.M.G., C.B., and Major Gen. W. W. O. Beveridge, C.B., C.B.E., D.S.O., K.H.P. London: His Majesty's Stationery Office.

This, the second of the two volumes of the British Medical History of the War devoted to Hygiene, is less generalized than the first and consists almost wholly of consideration of food in its relation to health and energy and the description of measures instituted for the prevention and control of certain diseases. The arrangement of subjects considered, by chapters, is as follows:

I. Food Rations in the United Kingdom.
II. Field Service Rations.
III. Prevention of Food Deficiency Diseases.
IV. Energy Expenditure in Relation to Food.
V. Prisoners of War.
VI. The Military Physical Test Station in Edinburgh.
VII. The Base Hygiene Laboratory at Boulogne.
VIII. Prevention of Malaria.
IX. Prevention of Cerebrospinal Fever.
X. Prevention of Trench Foot.
XI. Prevention of Flies.
XII. Prevention of Infestation by Lice.
XIII. Prevention and Control of Scabies.
XIV. Prevention of Bilharziasis (Schistosomiasis).
XV. Prevention of Trachoma.
XVI. Prevention of Smallpox.
XVII. Prevention of Plague.

Chapter I considers food rations in the United Kingdom and comprehensively discusses numerous food analyses and experiments made after the beginning of the war, supplementing analyses of Atwater and Bryant in America upon which estimation of the energy value of the various foods were formerly based. Numbers of changes in the scale of rations at various periods during the war, necessitated by food shortage, the greatest reductions being in the meat component, are described. The ration issued at the outbreak of the war yielded from 4,500 to 4,600 calories. At the end of 1915 reductions had brought down the caloric value to 2,783, but the purchasing power of a money grant of 4d. a day was estimated to bring up the value to 4,300. In February, 1916, the meat issue was further reduced to ¾ pound (1¼ pounds at the outbreak of the war), and the total value during this year was approximately 4,040. In 1917, distinction was made between soldiers under and over 19 years of age; the former continued to receive the 1916 ration while a reduction in the bread ration of the latter lowered the value to 3,893 calories; moreover, it was feared that the rise in food prices by reducing the number of calories purchasable with the money grant, now 5½d., would actually lower the values to approximately

3,700 and 3,400, respectively. This was the more disquieting in view of experimental marches having shown that the energy expended daily per man (soldier) was 3,989 calories, and of observations upon convicts performing moderate work which showed loss of weight on 3,500 calories barely prevented on 3,700 calories.

Consequently a survey of camps was made to determine the amount of food received by the soldier from the ration, from the money allowance, from that he purchased out of his own money, plus that received from home. This showed food from all sources in 1917 to total 3,961 and 4,188 calories in the case of men and boys, respectively. All evidence indicated that the troops were receiving just sufficient food. Further reduction in February and May, 1918, subtracting the loss for fat not consumed, lowered the caloric value of food eaten to slightly less than 3,500 for men and to not more than 3,700 for boys. This was sanctioned by the military authorities, in the exigency of the situation, pending a full inquiry as to the work performed by troops in training. It was then estimated by indirect calorimetry that soldiers over 19 were receiving from 400 to 500 calories too little and those under 19 just enough to balance the expenditure of energy without any allowance for growth. After special efforts had been made to reduce waste and to discourage the saving of food fat for the manufacture of munitions, it was apparent that the gross caloric value of the ration and allowance for soldiers over 19 was now about 3,400 and for those under 19 about 3,731. Allowing 200 and 250 calories, respectively, for food from private purchases and from home, there was then a deficiency of about 250 calories as regards soldiers over 19, and a sufficiency for both energy and growth, as regards the adolescent. At this time an extra allowance of 200 calories for the adolescent recruits was recommended. However, they presented no evidence of ill health, and some weighings showed that approximately 81 per cent had gained 1.38 pounds, 13 per cent had lost 1.07 pounds per month, and about 6 per cent had remained constant. This unexpectedly favorable showing was attributed in part to the fact that the recruits did less work than was intended, an hour's drill consisting of only forty or fifty minutes actual work, but was mainly because the anthropometric standard selected was wrong, the 1918 recruits being smaller than the British Association standard. The practical result of this investigation showed that the food received from all sources just balanced the output of energy of the adult recruit and that the young recruit received a surplus sufficient to permit the slight increase in weight which occurred. From a military standpoint the reduced diet was not considered satisfactory as it precluded any storage of reserve fat, and an increased issue of meat was urged; this, however, could not be made until 1919.

The feeding of civilian and women employees is also considered here; the ratio for women was 0.83 per cent of that for men. The diet of patients in hospital at the beginning of the war was based on the requirements of the individual patient and was largely determined by the attending medical officer. A system of exchange among hospitals of a monthly return showing average daily costs of subsistence resulted in the cost per patient being soon reduced by stages from slightly over 2s. to 1s. 4d. In June, 1917, an allowance of articles of food per 100 patients per day was adopted. This, in February, 1918, was amended by adopting two scales: a minimum, Scale A,

2,700 calories, applicable to hospitals containing mostly acute cases, and a maximum, Scale B, 3,250 calories, for hospitals containing patients in a more convalescent stage. Scale A was sufficient only when at least 60 per cent of the patients were acute cases. Medical authorities considered these scales too low but accepted them in view of the food shortage. A table is presented which shows a yearly saving resulting from these scales, of meat as represented by 14,000 bullocks, and of 4,800 and 2,800 tons respectively of bread and sugar. These scales were increased in October, 1918, after which convalescent patients received a caloric value above 3,500. In 1919, the proportion of convalescent patients having risen 80 to 90 per cent, a new scale representing 3,832 calories was put into effect. The system of dieting in Canadian hospitals in England was similar to that of the British, but for them an additional maximum diet scale for tuberculosis patients was adopted.

Chapter II considers the subject of field service rations which were most complex both as to composition and amount on account of the various factors of climate, seasonable changes, widely separated theaters of war, race, changeable conditions of war, sanitary considerations, and difficulty in obtaining certain articles. The field service ration at the beginning of the war contained 4,595 calories, but it was soon altered both as to composition and quantity to meet the transition to trench warfare, specialization of work, and various racial and local conditions. A table shows six changes made in the ration of the troops in France up to September 30, 1918, the main total reductions being meat, 5 ounces; bread, 3¾ ounces; bacon, cheese, and jam, each 1 ounce; and sugar ½ ounce. There was a slight increase of butter, cheese and milk. The caloric value at this time was 4,111. The reduced meat allowance was in part offset by a combination meat and vegetable ration and later by the introduction of pork and beans. From April, 1917, to January, 1919, a smaller ration of about 3,500 calories was issued to troops on the line of communications. Fresh vegetables were difficult to procure, and the dried substitute proved practically useless. Units receiving ample vegetables showed a smaller incidence of affections classified as "Inflammation of Connective Tissue." Great variations occurred in meeting the requirements of Indian and other races in labor companies. The caloric value of some of these rations were: Chinese, 4,213; Egyptian, 4,291; Fijian, 3,859; Naga Hill and Kaffir, 4,445. The Canadian personnel in forestry work received a special ration containing 5,681 calories, while the British forestry units received 4,852 calories. Men in the trenches were given an additional ½ ounce tea, and ¾ ounce sugar. A rum issue to those desiring it was authorized, at the discretion of the commanding general on recommendation of the medical officer. In Egypt, lime juice (1 ounce) with sugar (½ ounce) was issued in the absence of fresh vegetables. The caloric value here for British troops was 4,100. A special ration for the mobile column of the winter of 1917–1918 contained 3,900 calories; it comprised no vegetables and could be used only for short periods without the addition of locally procured fresh vegetables. The rations of the Indian and Egyptian troops were similar, the protein component being mainly of vegetable origin, the fats low, the issue of fresh vegetables small, and no sugar. Deductions were made in the ration of prisoners of war when they were idle.

A table of comparative food values which represents an investigation of an outbreak of pellagra among Turkish prisoners of war shows an estimated

protein content of the ration given them, by a labor and non-labor scale of 102.4 (biological value 45.6) and 90.5 (biological value 37.2) gms. respectively, as compared with 124.8 (biological value 92.6) normal scale for European troops. In Macedonia, the caloric value for British troops was a little less than 4,400, which was reduced to about 4,000 during the summer months, and that of the issue to the Serbian Army was about 3,355. In East Africa the problem was complicated by the great distance from base and the different racial and tribal dietaries to be considered, but notwithstanding the scarcity of vegetables and fruit little scurvy or beri-beri occurred. It is remarked that it would have been well to have grown gardens. In Mesopotamia, up to the latter part of 1916 scurvy was a cause of wastage among Indian, and beri-beri among British troops to a less extent. The latter did not occur among the Indians on account of the vitamines contained in the whole grain flours made from wheat and lentils which were issued to them instead of the white bread of the British. Rum was kept for issue during the winter, when sanctioned by divisional or higher command. In the latter part of 1916, improved transport made possible an increase of the meat and vegetable components of the ration, and a diminution of scurvy and beri-beri resulted. It is here observed that the lime juice issued, being six months or more old, possessed no anti-scorbutic value. The diminution of beri-beri was attributed to the addition of yeast, oatmeal and whole grain flours to the British ration. More importance was attached to the quality than to the quantity of the field ration. In North Russia, the general state of the troops was healthy. A few weeks after their first arrival the ration scale was improved and contained 4,431 calories. The two main features considered were the local lack of vegetables and the need of heat-producing components. Lime juice was given daily and whole peas and beans were supplied, which were germinated both to develop the vitamine content and to enhance palatability. The difficulties of transport to the front, even after frozen meats, fresh vegetables and fruits reached Archangel, are interestingly described. A special ration yielding 5,706 calories and containing a composite preparation was issued mobile detached columns. This was easy of transport and possessed both anti-scorbutic and laxative properties.

Chapter III considers the prevention of food deficiency diseases. Among the important conclusions reached from experimentation and experience are: The anti-scorbutic are less widespread and stable than the anti-neuritic vitamines; high temperatures have a destructive effect on vitamines; yeast, haricot beans, and oatmeal proved most successful in the prevention and treatment of beri-beri; yeast has no anti-scorbutic property; pulses, germinated, are valuable in the prevention of scruvy, but are useless in a dry state; lime juice has little or no anti-scorbutic effect after standing six months or longer and lemon is four times more potent than lime juice.

Chapter IV is devoted to a consideration of energy expenditure in relation to food and presents the results of calculations, from experiments made during the critical food shortage, of energy output under the various conditions of exercise and work of the soldier. Among the many interesting results recorded was that the most economical rate of marching is 88.38 yards per minute and that it is more expensive to march much below 90 than above 90 up to 130 yards per minute; 10 per cent more calories were expended in covering 100 yards at 60 than at 90 yards per minute. The expenditure of energy

of those marching at the rear of the column was greater than that of those at the front, and increasing the load markedly increased the expenditure. It was found that the maximum load of the soldier, without impairing his fighting efficiency, should not exceed one-third of his body weight. The chapter concludes with the statement that a most important problem is to make lighter the load of the individual soldier.

Chapter V considers the hygienic control of prisoners of war; the subject is treated from the aspects of housing, water, rations, exercise and employment, and medical attendance. The different rations for such prisoners in the various theaters of war are described. It was found that monetary inducement did not result in the maximum output of work when additional food could not be purchased. The ration compared favorably with what was available for the public generally. The health of the prisoners of war was satisfactorily maintained and no water-borne diseases were recorded.

The appearance of pellagra among Turkish prisoners of war in Egypt was attributed to infection prior to capture, and the occurrence of scurvy at the camp on the Isle of Ramsay to the method of overcooking the ration.

Chapter VI describes the work conducted at the Military Physical Test Station at Edinburgh which was concerned chiefly in determining the fitness and stamina of soldiers over 40 years of age who, though organically sound, were incapable of sustained exertion. Martin's ergometer, the apparatus used, is described and illustrated.

Chapter VII discusses the Base Hygiene Laboratory at Boulogne which conducted general chemical, bacteriological and toxicological investigations. Four hundred eleven chemical and 568 complete bacteriological examinations of water supplies were made. A potable water was rarely found. Eight hundred ninety-three food samples were analyzed with record of but few rejections and with negative results in the cases of those suspected of having caused diarrhea. Only 3 out of 180 drug analyses showed any impurity or defect. Fifty-six toxicological examinations were made in cases of death from suspected poisoning. Of interest is the account of examinations of wheat from the fields in the forward area, which showed no deleterious effect from gases.

The prevention of malaria, which was serious on the fronts in Macedonia, Palestine, Mesopotamia, and East Africa, is considered at length in Chapter VIII, but no new principle in either prevention or treatment was evolved. The deciding factors in the occurrence of malaria were found to be temperature and physical configuration—rainfall, latitude and elevation being secondary. However, mosquito-infested wells in arid Palestine and oases in the Sahara rendered these regions as dangerous as countries apparently better physically. The indigenous occurrence during the war of malaria in parts of Europe where it is not normally endemic, was recorded and was due to the presence of anophelines and the importation of carriers. It is stated that further investigation must be made before definite conclusions, as to the exact relationship between temperature and the development of the anophelines in different countries, and the sexual stage of the different protozoa in the mosquito, can be drawn. Some interesting points are noted, viz., whether in the tropics breeding of all species continues throughout the year or ceases for a period independent of the existence of suitable breeding places; the

probability of variations in the period of incubation of the protozoa within the mosquito for different latitudes. It was found that, in countries where winter conditions prevented all-the-year-round infection, the beginning of vivax infection preceded falcifarum infection by about a month and that the maximum incidence of the later was about two months later than that of the former, under conditions of normal temperature. In temperate countries where there was no endemicity but where infection occurred from imported carriers, the vivax was the only parasite discovered among genuinely indigenous infections. The conclusion is therefore drawn that there is an association of different temperature conditions with the development of the sexual stage of the parasites in the mosquito, concerning which definite information would be of great importance for purposes of prevention. It is noted that malaria has never been continuously endemic in England and that the years 1856–59, during which the last extensive incidence which was associated with the return of ague-infected troops from the Crimean War was recorded, were characterized by high temperature long sustained in each year, followed by a year which was phenomenally cold, after which malaria suddenly disappeared. Furthermore, during the World War the main outbreaks in the years 1917, 1918 and 1919 occurred just about one month after the onset of seasons of high temperature with more or less daily continuity. The statement appears that there is ground to believe that the mean temperaturn over certain months may be sufficiently high to check plasmodial sexual development and that, if temperature alone accounts for the non-sexual development in the human body, a temperature of 98° F. will obviously prevent sporozoit development in the mosquito.

On all fronts where malaria was endemic the three recognized parasites, *Plasmodium vivax*, *falcifarum*, and *malariae*, and no others, were met with. Vivax infection was the most, and malariae the least, common. It was found that in any given malarial area, while the vivax and falcifarum were usually found over the entire area, the quartan parasite, if found at all, was only in limited districts within the area. The loss of man-power from malaria far exceeded that from any other disease, and the loss and deterioration of troops in eastern Europe, Palestine, Mesopotamia and East Africa were very great, and notwithstanding the lesson of the Crimean War in the same area, whole battalions became practically unfit for field service in the Macedonian Expeditionary Force, where the hospital admissions for malaria for September and October, 1917, were over 32,000. In East Africa, malaria accounted for 60 per cent of all admissions of troops in 1917. The minimum period for detention for treatment in England was 60 days.

The preventive measures instituted are given as follows:

1. Drug prophylaxis and treatment.
2. Culicifuges or mosquito deterrents.
3. Personal protection.
    (*a*) Siting of camps.
    (*b*) Evacuation of areas.
    (*c*) Screening of dwellings.
    (*d*) Clothing:
        (i) Head nets.
        (ii) Gloves.
        (iii) Flapped shorts.
        (iv) Sleeping nets.

4. Mosquito destruction.
   (*a*) Destruction of imagines.
   (*b*) Destruction of ova, larvae, pupae:
      (i) Disinfectants.
      (ii) Oiling.
      (iii) Conversion.
   (*c*) Removal of breeding places.

The prophylactic value of quinine was debatable and the evidence generally was against its practical value. No method of administration of quinine in routine treatment was found of superior value to the oral.

Chapter IX discusses the prevention of cerebrospinal fever, of which only 4,238 cases, with a mortality of 45.5, occurred in the United Kingdom, and it is concluded that had it been possible to increase the limited cubic space (400 feet) in barracks, the incidence would have been almost nil. A central laboratory with some forty subsidiaries, and also a motor laboratory for emergencies, were established for special work in the control of this disease. Specialist sanitary officers of commands were appointed to supervise the work pertaining to this disease in their own commands. The steam spray method for intensive local disinfection of the nasopharynx was instituted early in 1916, and its use later was extended to transports. Of the antiseptics used with this, best results were obtained from chloramine-T and sulphate of zinc. This treatment was found to lower both the carrier and incidence rate. In the operation of lumber puncture, the opinion prevailed that best results were obtained under general anesthesia. No general protective inoculation was attempted, and the swabbing of entire camps was found impracticable.

Chapter X describes measures for the prevention of trench foot which, when faithfully prosecuted, were found highly successful. These consisted generally in the maintenance of a fit hygienic condition, protecting the feet from mud and wet, keeping them warm, dry and clean, maintaining circulation, improving the condition of the trenches, and providing hot food. The application of oils and greases was merely accessory, the benefit derived from their use accruing from the friction employed in applying them. The institution of "foot-washing centers" was unqualifiedly successful.

Chapter XI deals with the prevention of flies, which became one of the most important sanitary problems particularly in the east. A marked reduction of fly-borne diseases in the later stages of the war resulted from knowledge acquired in earlier investigations. The life cycle of the housefly is reviewed and the results described of various investigations which confirm the important rôle of the fly in disease transmission. Preventive measures were directed to the destruction of the eggs, larvae and pupae, and of the adult fly, and embraced the stereotyped procedures usually adopted in the disposal of horse manure, fecal matter and garbage and in poisoning and trapping flies. Formalin and sodium arsenite, among the poisons, gave the best results. The Balfour trap, which was used to a great advantage, is described and illustrated. Of interest was the discovery that ordinary fishing nets with a mesh of ¾ inch, loosely hung over doors, were sufficient to deter flies from entering. The only effective protection against sand flies, which caused much sickness on the eastern front, was mosquito netting.

Chapter XII considers at length the prevention of lice infestation. Much attention was devoted to this subject. due to the importance of lice in the transmission of typhus, relapsing and trench fevers. The biology and habits

of the louse, which entirely depends on human blood for sustenance and on the human body and clothing for prolonged life and reproduction, are reviewed. Measures of prevention comprised the detection of infested men, their cleansing by bathing, and the disinfestation of clothing, bedding and billets. Detection was by frequent inspections, and weekly baths and changes of underclothing were required whenever possible. The divisional, portable, and vapor or steam baths employed are described in detail. The chapter concludes with a comprehensive, illustrated description of the various methods, improvisations and apparatus used in disinfestation. It is stated that probably 50 per cent of admissions to hospital from field armies were due to vermin and lack of personal cleanliness, and the importance of laundries and facilities for bathing and disinfestation is stressed.

Chapter XIII discusses the prevention and control of scabies which was most commonly complicated by impetigo. The presence of scabies created an additional danger by rendering the soldier more susceptible to inoculation with trench fever. From a study of the etiology it was found that infection was conveyed by body contact, by blankets and clothing, and that clothing remained infective for at least eleven days. It was also found that a form of scabies may be contracted from domestic animals, more particularly the horse, suffering from mange. The control depended upon early diagnosis by routine inspections, careful treatment, and disinfection of clothing and bedding. Sulphur medication was employed, the liquor calcis sulphuratae being preferred to the ointment.

Chapter XIV considers the prevention of Bilharziasis, which was of interest as 625 men were infected in the South African War, and also by reason of its presence in Mesopotamia and more particularly in Egypt. An investigating committee, after experimentation in Egypt in 1915, found that the intermediate hosts of the larvae are fresh-water snails and that the cercariae enter the human body through the buccal mucous membrane and through the skin; that ordinary chlorination of water is not sufficient to destroy the cercariae but that they are instantly killed by exposure to a temperature of 50° C. and are also killed after storage of raw water for forty-eight hours. Intravenous injections of antimonium tartaratum presents a hopeful prospect in the treatment of Bilharziasis.

Chapter XV deals with the prevention of trachoma which resulted from the introduction of colored labor into France. Forty-five per cent of the Egyptian laborers were either suffering from or had previously been affected with trachoma, and the incidence among the Chinese and Cape Boys was 8 and 3 per cent, respectively. The principles followed were: frequent inspections, combing out and grouping those affected in separate companies; limiting ocular discharge by treatment, and frequent sterilization of towels. By adherence to these principles, the spread of the disease to the troops and French population was prevented.

Chapter XVI discusses the prevention of smallpox. This is interesting in view of the authorization in 1916 of the enlistment in view of the authorization in 1916 of the enlistment of men who declined vaccination and whose presence among the troops on those fronts where smallpox was prevalent constituted a menace. Notwithstanding this fact, the incidence of smallpox in the British force in France was only 12 for the period of the war. The small number is attributed to the action taken by both the Allies and the

enemy in creating a protected population in the midst of which unprotected British troops were safe. The incidence in the Far East was apparently comparatively low, although accurate figures are not yet available. However, 1,908 cases occurred from December, 1916, to October, 1919, in Mesopotamia, where the disease is endemic. The spread of smallpox was attributed to the presence of many unprotected men, the difficulties of diagnosis, isolation and disinfection and of procuring vaccine because of inadequate supply and the problem of transporting it in the tropical heat. It is shown that in one instance in a strength of 1,749 men, 204 of whom were unprotected by efficient vaccination, 25 cases of smallpox with 5 deaths occurred in the unprotected, and 5 cases with no deaths in the protected. The mortality is shown in 1,068 cases as: British, 516 admissions, 86 or 16.6 per cent deaths; Indian, 552 admissions, 56 or 10.1 per cent deaths. The lessons taught were the importance of compulsory vaccination, the need for training medical officers in diagnosis and in the operation of vaccination, means for distribution of vaccine under extreme climatic conditions, and adequate facilities for isolation and disinfection.

The concluding chapter considers the prevention of plague which caused much apprehension in the east but occurred to any extent only in Mesopotamia. This country had an unenviable reputation for this disease, and its spread was favored by the custom of transporting stores mainly by ships. In the civil population of India, 1,799,088 deaths from plague were recorded during the period 1914–1917. For the same period the incidence in Egypt was 2,888 cases with 1,458 deaths. A close relationship was found between flea prevalence and the season of the year, a temperature above 30° C. being unfavorable to the flea. Other than rats, the animals most commonly subject to plague infection are mice, sheep, deer, pigs and dogs. Admissions in the Mesopotamian Expeditionary Force from July, 1916, to October 31, 1919, numbered 411. The recorded civil admissions for the same districts were 1,928. Preventive measures instituted were of two groups—those for the protection of the community, and of the individual. In the former rat and flea destruction were preeminent; special personnel was trained for rat destruction, poison baiting and trapping being the chief means employed on shore and Clayton disinfecting machines on ships and barges. Fleas were destroyed by the disinfection of kits and quarters. Inoculation was the chief measure of protection for the individual. In 91 military cases cited, 30 who had been inoculated showed a mortality of 20 per cent, while in 61 non-inoculated the mortality was 70.5. Mortality in the civil population varied from 68.2 to 70.0. Evacuation of localized areas was frequent, but a general evacuation of infested areas did not become necessary. Practically all cases were of the bubonic type, and data presented on 92 cases show the following distribution of the bubo: Inguinal, 52; axillary, 23; cervical, 13; miscellaneous, 4. Of interest is the observation that four cases, inoculated during either the incubation period or in fervescence, died from profound septicemia more quickly than the non-inoculated cases.

A number of army orders and instructions issued for guidance in connection with the control of typhus, cholera, cerebrospinal fever, trench foot, frostbite and smallpox appear as appendices to the volume.

The volume comprehensively treats the subjects comprised, is creditably

illustrated, and, in addition to its general interest to the medical profession, should be a valuable handbook for the dietitian and epidemiologist.

Le Pratique du Pneumothorax Therapeutique. Deuxième Edition, Revue et augmentée. Par. F. Dumarest, Medecin en chef des Sanatoriums Mangini et Belligneux, et P. Brette, Ancien Interne des Hopitaux de Lyon Medecin Assistant au Sanatorium Mangini à Hauteville (Ain). 8°, 356 pp. Paris: Masson et Cie, Editeurs, Libraires de L'Academie de Medecine, 120, Boulevard Saint-Germain, 1923.

It occasionally happens that distressing accidents point the way to epoch-making steps in therapy. It is doubtful whether treatment of pulmonary tuberculosis by artificial pneumothorax would ever have been conceived of had not spontaneous pneumothorax served as the starting point for the imagination.

Dr. Dumarest's book is a study of the *ensemble* of artificial pneumothorax. In it the author supplies at one and the same time a complete description of the technique, the necessary apparatus, the accidents which may occur, and—on the other hand—the other considerations which the practising physician must bear in mind—namely, the general application of the method, its complications involving the pleura, and a study of its net results. He discusses those physiological considerations which have to do with the mechanism of pneumothorax and treats in detail of its general indications and contraindications. His own personal experience, of long duration, must give to any pronouncement from his pen on this subject a very especial influence.

He and the gentleman associated with him in co-authorship make very apparent effort to see always the point of view of the practising physician. They have attempted in the second edition to include all those modifications and modalities of technique which constitute a résumé of their own experience in artificial pneumothorax. They treat broadly and with great clarity the general method of the procedure, its pathological physiology, the complications which concern the pleura, the application of artificial pneumothorax in the treatment of pulmonary gangrene, and the comparative worth of extra-pleural thoracoplasty and artificial pneumothorax.

The book is not profusely illustrated, but those illustrations which have been embodied therein are very entirely to the point. They consist largely of reproductions of Roentgenograms from chests in which artificial pneumothorax has been practised.

There is an extensive table wherein is given a résumé of cases that have been studied. All references to other literature are embodied in a "Bibliographie spéciale" and a "Bibliographie générale."

A. N. Tasker.

Endocrine Diseases, including their Diagnosis and Treatment, by Wilhelm Falta, Vienna. Translated and edited by Milton K. Meyers, M.D., Neurologist to the Northern Liberties Hospital; to the Lucian Moss Home, Jewish Hospital; to the Dispensary of the St. Agnes Hospital, Philadelphia, etc. With a foreword by Sir Archibald E. Garrod, K.C.M.G., M.D. (Oxon.), F.R.C.P. (London), F.R.S., Regius Professor of Medicine, Oxford University. Third Edition, with supplementary notes by the editor (the previous

edition bore the title of the Ductless Glandular Diseases). 104 illustrations in the text. 8°, 669 pp. Philadelphia: P. Blakiston's Son & Co., 1923.

Since the day when Addison first described the disease which bears his name, and showed that its essential pathology was to be found in the suprarenal glands, the field of endocrinology has so vastly expanded as to make it at present a subject of utmost importance for the physician, the surgeon, the physiologist, and the biological chemist. The ductless glands had long been known anatomically, but only within recent years has any definite knowledge concerning their functions been acquired. Even now there is much—probably much more than is really conceived of—that is obscure, and the future undoubtedly holds in store a tremendous extension of experimental research into the physiology of these structures. The editor stated in his preface to the first edition that he desired "to furnish, not merely a faithful rendering of the German text, but also a rounding out of the subject by the consideration of recent American and English views." A critical examination of the text of the present edition shows conclusively that his ambition in this regard has not been modified.

The place which Falta's name has so long occupied in the list of careful and painstaking, German-speaking research workers will induce a definite assurance that his original work was extraordinarily well-founded. It must be accepted as true that many of the later theories advanced concerning the ductless glands and their functions have been no more than a development of the general scheme of endocrinology originally set forth by him. He was one of the earliest pioneers in this field.

The foreword by Sir Archibald E. Garrod outlines briefly the history of certain special facts relating to this side of medical science, and then proceeds to indicate in a few words the scope and aim of the present volume.

The work is essentially clinical in its conception. In other words, the symptom-complexes resulting from disorders of the glands of internal secretion are accurately described with such wealth of data as will give most assistance in the matter of differential diagnosis. It combines actual clinical experience at the patient's bedside with experimental research in the laboratory. As such it is free from that one-sidedness of viewpoint which is so apt to characterize the works of an author who has served only as a clinician or as a laboratorian. It is certainly an important contribution to the literature on general endocrinology.

A. N. Tasker.

International Clinics, a Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles on Treatment, Medicine, Surgery, Neurology, Paediatrics, Obstetrics, Gynæcology, Orthopædics, Pathology, Dermatology, Ophthalmology, Otology, Rhinology, Laryngology, Hygiene, and Other Topics of Interest to Students and Practitioners, by Leading Members of the Medical Profession Throughout the World. Edited by Henry W. Cattell, A.M., M.D., Philadelphia, U.S.A., with the collaboration of Chas. H. Mayo, M.D., Rochester; Sir John Rose Bradford, M.D., London; William S. Thayer, M.D., Baltimore; Frank Billings, M.D., Chicago; A. McPhedran, M.D., Toronto; Sir Humphry Rolleston, K.C.B., M.D., D.C.L., London; Seale Harris, M.D., Birmingham, Alabama; Hugh S. Cumming, M.D., D.P.H., Washington, D. C.; John G. Clark, M.D., Philadelphia;

James J. Walsh, M.D., New York; Charles Greene Cumston, M.D., Geneva; John Foote, M.D., Washington, D. C.; Charles D. Lockwood, M.D., Pasadena, California. Correspondents, A. H. Gordon, M.D., Montreal, and James Burnet, M.D., Edinburgh. Vol. II, Thirty-third Series, 1923. 8°, 304 pp. Philadelphia and London: J. B. Lippincott Company, 1923.

The Lippincott series of International Clinics has, since its inception, commanded the services of recognized authorities in the various specialties of medicine and its allied sciences. The authors of the articles contained in Volume II, Thirty-third Series, are no exception to the rule. The first 54 pages of the book are given up to a discussion of insulin by Drs. Alexander McPhedran, F. G. Banting, Seale Harris, Louis P. Hamburger, and Orlando H. Petty. The phase of insulin with which all of these gentlemen deal is its use in the treatment of diabetes, and their common conclusions may be summarized as follows:

1. Insulin is the active, potent, internal secretion of the islands of Langerhans.
2. Insulin, if properly administered, *i.e.*, subcutaneously in appropriate amounts and at proper intervals, will reduce the blood sugar to normal, render the urine sugar-free, and if the diet is properly arranged, will enable the diabetic to continue his usual professional or business pursuits without fear of acidosis or exhaustion.
3. Diabetics requiring operation, by the use of insulin, can be put in such a condition, in a short time, that only the choice of anaesthetics need be considered.
4. Untreated or improperly managed diabetics who have gone into coma, even with pernicious vomiting, within a few hours can be restored to consciousness, and, ultimately, to a pleasant and useful life if insulin is heroically yet carefully administered.

Medical diagnosis and treatment is the general subject with which the next division of the volume concerns itself. Dr. W. Storm Van Leeuwen, of Leiden, Holland, discusses "Diagnosis and Treatment of Allergic Diseases," using hay fever and asthma as the type diseases. Dr. Francis, of the United States Public Health Service, reviews that relatively new disease, tularaemia, with which his own name is so intimately connected. Among the other articles Dr. Charles Goodman, of New York, contributes a very interesting and valuable one on "Blood Transfusion Made Easy." He offers an interesting suggestion that many hundreds of public charges in the pay of large cities be used as blood donors. These should be given numbers and in turn should donate certain amounts of their blood to a central clearing station for transfusion, such clearing station being attached to one of the city hospitals. Such a method would allow blood already "grouped" to be obtained at a few minutes' notice by ambulance, together with the services of a trained technician.

The third section of the book is devoted to surgery. Dr. Hewson, of Philadelphia, contributes "A Case of Double Vagina, Double Uterus and Double Douglas's Pouch." The frontispiece of the volume is a reproduction in colors of the pelvic view of this case. Dr. Charles Greene Cumston, of Geneva, devotes himself to certain interesting "Problems in Surgical Diagnosis, Pathology and Treatment." These problems are (*a*) Lymphadenia of the testicle; (*b*) The treatment of ano-rectal hemorrhage; (*c*) Rupture of varicocele; (*d*) Gastrosuccorrhoea, or Reichmann's syndrome; (*e*) Epithelioma of the

sebaceous glands of the penis; (*f*) The recurrence of cancer in the opposite breast; (*g*) Extra-hepatic non-malignant tumors of the bile ducts. The obituary of Dr. John William Ballantyne concludes the volume. "International Clinics" furnishes, as ever, valuable and interesting reading.

A. N. Taskeb.

Legal Medicine and Toxicology, by Many Specialists. Edited by Frederick Peterson, M.D., LL.D., Manager Craig Colony for Epileptics; formerly Professor of Psychiatry, Columbia University; Consulting Alienist to Bellevue Hospital, and to the Manhattan, Flatbush, and Central Islip Hospitals for the Insane, New York; Walter S. Haines, A.M., M.D., late Professor of Chemistry, Materia Medica, and Toxicology in Rush Medical College; late Professorial Lecturer on Toxicology in the University of Chicago, and Ralph W. Webster, M. D., Ph.D., Assistant Professor of Medical Jurisprudence in Rush Medical College; Director of Chicago Laboratory, Clinical and Analytical. Second edition, 2 volumes, 8°, 2,268 pp. Philadelphia and London: W. B. Saunders Company, 1923. Price, $20.00.

It would be difficult to conceive of a general textbook on the subject of legal medicine and toxicology that is more complete than this one. The various chapters are written by authors recognized as leading authorities in their special fields. Since the first edition a number of contributors have died or have been unable to continue the work, and their articles have been rewritten by others. So extensive have been the additions and revisions that the book is practically a new work, though many of the subjects have been revised by their original authors. More than forty writers have contributed chapters to this important book. The work is extremely valuable and interesting and is one that will appeal strongly to the physician whose duty it may be to give technical evidence before a civil or military court. Volume I covers the subject of Forensic Medicine, the chapters being on the "Legal Rights and Obligations of Physicians"; "Identification of the Living"; "Identity"; "The Signs of Death"; "Sudden Death"; "Death from Cold, Heat, and Starvation"; "Death and Injuries by Lightning and Electricity"; "Wounds"; "Gunshot Wounds, Burns and Scalds"; "Railway Injuries"; "Injuries and Disorders of the Nervous System Following Railway and Allied Accidents"; "Speech Disorders"; "Inebriety"; "The Stigmata of Degeneration"; "Mental Disorders in Medicolegal Relations"; "Mental Defect Group"; "Mental Perversions of the Sexual Instinct"; "Malingering and the Feigned Disorders"; "Summaries of State Laws Relating to the Insane"; "The Legal Aspects of Pregnancy"; "The Legitimacy and the Determination of Sex"; "Birth and Legitimacy"; "Abortion"; "Infanticide"; "Impotence and Sterility"; "Rape"; "Unnatural Sexual Offenses"; "Marriage and Divorce"; "Medicolegal Aspects of Vision and Audition"; "Medicolegal Relations of Venereal and Genitourinary Disorders"; "Medical Jurisprudence of Life Insurance"; and "Medical Jurisprudence of Accident Insurance."

Volume II is devoted to Toxicology, the chapters being "General Principles of Toxicology"; "Forensic Questions Relative to Poisoning"; "The Technique of Medicolegal Postmortem Examinations"; "Inorganic Poisons"; "Gaseous Poisons"; "Death from Asphyxia"; "Alkaloidal Poisons"; "Non-Alkaloidal Organic Poisons"; "Industrial Toxicology"; "Food Poisoning and Food-borne Infections"; "Poisonous Mushrooms"; "Poisonous Proteins";

"Postmortem Imbibition of Poisons"; "The Destruction and Attempted Destruction of the Human Body by Fire and Chemicals"; "Death from Pounded Glass and Other Mechanical Irritants"; "Medicolegal Examination of Blood and Blood-stains"; "Medicolegal Examination of Seminal Stains"; "Medicolegal Examination of Hairs"; "Medicolegal Relations of the X-Rays, Radium, and Ultraviolet Rays," and "The Common Law and Statutory Obligations of Pharmacists."

The directions for the various laboratory and other precedures are explicit and in many cases are accompanied by satisfactory sketches. In the section on legal medicine, case histories and court decisions are quoted, and this adds much to the value of the work. Many of the sections contain paragraphs on treatment to be prescribed in various intoxications.

EDGAR ERSKINE HUME.

STANDARD METHODS OF MILK ANALYSIS OF THE AMERICAN PUBLIC HEALTH ASSOCIATION AND THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS. Fourth Edition. 8°, 40 pp. American Public Health Association, New York, 1923. Price, 40 cents.

This valuable booklet on milk examination was prepared under the general direction of the American Public Health Association and the Association of Official Agricultural Chemists. The methods described are those recommended by the best authorities, and the existence of an inexpensive booklet of this kind is a great help to the student and laboratory worker. The fact that the third edition was rapidly exhausted is evidence of the extended use of the book. Both bacteriological methods and chemical methods of analysis are described.

EDGAR ERSKINE HUME.

BAKTERIOLOGISCHES TASCHENBUCH; Die wichtigsten technischen Vorschriften zur bakteriologischen Laboratoriumsarbeit, by Dr. Rudolf Abel, Geheimen Ober-Medizinalrat, o. ö. Prof. der Hygiene an der Universität Jena. Bearbeitet von Dr. Otto Olsen, Privatdozent für Hygiene und Bakteriologie an der Universität Freiburg i. Br. Sechsundzwanzigste Auflage, Leipzig, Curt Kabitzsch, 1923. 16°, 145 pp.

This is a type of book that the German medical student likes to carry about in his pocket to be read at odd moments, and in such way much information is absorbed. A book that has run through 26 editions, of which there has been one a year during the last twenty years, is assuredly popular. The work is far superior to the ordinary "quiz compend," and there is a great deal of valuable information contained in a brief space. There are general chapters on the use of the microscope, media and their preparation, staining methods, special sections on the more common bacteria and protozoa and instructions for bacterial examination of water, etc., also certain principles to be observed in animal experimentation.

EDGAR ERSKINE HUME.

THE SURGICAL CLINICS OF NORTH AMERICA. Issued serially, every other month (six numbers per volume); octavo; illustrated. Volume III, Numbers 1 and 2. Philadelphia and London: W. B. Saunders Company. Price, cloth, $16.

These two numbers are of the same high order of excellence as those which have preceded them. The Philadelphia number opens with a clinic by Dr. John B. Deaver. The teachings are in his enthusiastic, accurate style. Any surgeon who will follow the technique for the removal of stones from the gall-ducts and for the removal of the gall-bladder in the way described by Dr. Deaver will surely have done for his patient what the best technique of today affords. Several other cases are presented by Dr. Deaver, among them one illustrating the difficulties sometimes to be encountered in the differentiation of acute pancreatitis from other lesions in the so-called acute abdomen. Dr. A. P. C. Ashhurst reports a number of cases of the surgery of the stomach illustrating some of the pitfalls in diagnosis and prognosis. Among other clinics of interest is that of Dr. John H. Jopson, in which he tells how to treat a carbuncle, illustrating it by the presentation of a patient with a carbuncle on the back of the neck. The doctor recommends "exercising the affected area, including all of the openings of the carbuncle and the underlying infected and infiltrated connective and fatty tissue, with the electrocautery knife." He says this method was first brought to his attention by Dr. A. C. Scott, of Temple, Texas, whose work in cautery dissection of all types, particularly in the treatment of cancer, was noted by the reviewer in the October, 1922, or southern number. However, the treatment of carbuncles with the actual cautery is an old practice and is an absolutely efficient method; it will stop the progress of any carbuncle if thoroughly applied, the earlier the better. Small soldering irons are best for this purpose. The cautery not only destroys the infection but stops the pain. The reviewer learned this practice from Dr. Chas. Mayo about twenty years ago.

Dr. P. C. Skillern, Jr., among a number of other interesting, well-reported cases, includes one of a Fracture of a Semilunar Cartilage of the Knee with Fringe Pinching. At operation, instead of employing the usual incision and technique recommended by Rutherford Morison, Robert Jones, and other surgeons of experience in this type of work, he divided the quadriceps tendon, patella, and ligamentum patellae in a Z-shaped manner. The resulting flaps gave a good exposure for the removal of the internal semilunar cartilage, together with the hypertrophied synovial membrane and its anterior extremity. However, a report made four months after operation would indicate that the result was not as good as had been hoped, as far as the freedom from pain and function of the knee were concerned. The wide experience of Rutherford Morison and his colleagues at Newcastle on Tyne, in operations for fractures and lacerations of the semilunar cartilages has demonstrated that they can practically all be accurately and safely handled by the well-known simple incision most commonly employed, and the rather formidable Z-shaped method would hardly seem justified. When necessary the whole knee-joint can be exposed by quite as efficient, but simpler methods.

All of the Clinics in this number are instructive.

The New York number opens with a well-illustrated clinic by Dr. Fred H. Albee on Un-united Fracture of the Lower Jaw, with or without Loss of Bone. Some beautiful osteoplastic work is illustrated; in one case a graft taken from the wing of the ilium, was made to restore the substance of the lower jaw from the last molar on one side to the back of the last molar on the other. Dr. Albee is certainly a master in the art of osteoplastic surgery, and his work can be studied with profit by any surgeon, even the most expe-

rienced. Dr. William A. Downes has an excellent paper on Hour-Glass Contraction of the Stomach and has very simply but practically illustrated how in this pathology a gastro-gastrostomy may be done, and when, in an obstruction of the pylorus, a Finney pyloroplasty is added instead of a gastroenterostomy. Dr. Chas. Gordon Heyd uses a case of Hydrops of the Gall-bladder to particularly call attention to the intimate association of hepatitis with cholecystitis, as particularly pointed out in this country by Graham of St. Louis, the chief channels of infection being through the communicating lymphatics. The reviewer is pleased to note that Dr. Heyd. in his operative technique in removal of the gall-bladder, takes the precaution to use a prophylactic drain instead of the growing custom among some clinicians to dispense with all drains after removal of the gall-bladder in non-suppurative conditions. The reviewer personally knows of several deaths, the result of accidents following the no-drainage practice, and has no doubt that complications and fatal endings must occasionally happen from this practice. Dr. Deaver, of Philadelphia, has told the reviewer that he has been called in consultation to see several fatalities following this no-drainage type of operation, and that it is his practice to always drain for a reasonable time.

A number of other interesting clinics are reported by Doctors Walton Martin, Edwin Beer, and Clarence A. McWilliams. Dr. DeWitt Stetten calls attention to the Anomalous Relations of the Cystic Duct or Gall-bladder to the Hepatic Duct, illustrated by two cases, in one of which the hepatic duct was unwittingly injured, and in the other injury was avoided because the anomaly was recognized in time. Sometime ago a well-known clinic reported that fifty cases of operative injury to the hepatic and common ducts had consulted them. This in itself gives a conception of the frequency of injury to the common and hepatic ducts in the operation of cholecystectomy and in operations upon the gall-ducts themselves. Several articles have appeared in the medical press in the last two or three years calling attention to anomalous relations that can be encountered in such operations, and this should always be borne in mind.

In Hans Kehr's work on the Surgery of the Gall-bladder and Gall-ducts will be found the best described and illustrated writings upon this subject that probably have ever been published. Kehr's work, by the way, should be in the hands of every surgeon who pretends to do surgery of the gall-bladder and gall-ducts.

JOHN E. SUMMERS, M.D.

THE HUMAN FACTOR IN INDUSTRY, by Lee K. Frankel, Ph.D., Third Vice-President, and Alexander Fleisher, Ph.D., Assistant Secretary, Metropolitan Life Insurance Company, with the cooperation of Laura S. Seymour. New York: The Macmillan Company.

It has been only within the past decade that the "human machine" has been recognized to be of paramount importance in industry. Prior to this period, when a plant physician was employed at all it was for the purpose of rendering first aid to accident cases.

The methods of our large industrial establishments have changed so that at present greater care is given toward the selection of the proper individual for the job, the reduction of labor turnover, the loss of time from duty, etc.

This little volume contains 337 pages divided into the following chapters:

I. Introduction.
II. Hiring and Holding.
III. Hiring and Holding, continued.
IV. Education.
V. Working Hours.
VI. Working Conditions.
VII. Medical Care.
VIII. Method of Remuneration.
IX. Refreshment and Recreation.
X. The Employer and the Community.
XI. Insurance, Savings, and Loans.
XII. Organization of the Department of Labor Administration.

The book will be found to be of great value to the physician who is interested in industrial medicine.

GEORGE F. LULL.

BACTERIOLOGY; A Study of Micro-organisms and Their Relation to Human Welfare, by H. W. Conn, Ph.D., formerly Professor of Biology at Wesleyan University and Bacteriologist of the State Board of Health of Connecticut, and Harold J. Conn., Ph.D., Soil Bacteriologist at the New York Agricultural Experiment Station. Baltimore, Md.: Williams and Wilkins Company. Price, $4.00, United States, Canada, Mexico and Cuba, $4.50 other countries.

This book was written for the use of college classes in first year bacteriology who may or may not intend to follow the subject further along medical or agricultural lines.

The subject matter is divided into three parts and an appendix, as follows:

Part I. General Bacteriology.
Part II. Non-pathogenic Organisms.
Part III. Pathogenic Organisms.

The first fifty-four pages are devoted to a history of Bacteriology. The subject is considered chronologically from the observations of Kircher, in 1671, down through the work of Pasteur, Koch and others to the present time. This portion of the book is given over to historical facts in order to acquaint the beginner with some knowledge of the most interesting development of the subject, the study of which he is about to take up.

The book contains a moderate number of original drawings which are fair only.

There are several errors in orthography which are unfortunate as they have to do with specific or generic names of vectors of disease.

The work as a whole will be found of value for what it is intended, namely, an introduction to the study of the subject of bacteriology.

GEORGE F. LULL.

LEITFADEN DER PRAKTISCHEN KRIEGSCHIRURGIE, by Dr. Walter von Oettingen, Professor in Berlin, Leitendem Arzt beim Roten Kreuz. *Rünfte*, ganzlich umgearbeitete Auflage 11. und 12. Tausend mit 121 Abbildungen im Text. Mit einem Anhang die Heereskrankheiten und ihre Bekämpfung (K. S. O. Ziff, 350-508) von Dr. von Scheurlen Generaloberarzt A. L. S. Des Kgl. Württ. Sanitätskorps, beratender Hygieniker, wirklicher Obermedizinalrat, Mitglied des Reichsgesundheitsrats. 8°, 100 pp. Dresden u. Leipzig: Theodore Steinkopff, 1918.

The first edition of this excellent manual of military surgery appeared in June, 1912, the second edition in August, 1914, and the fifth edition in December, 1917. In very terse and concrete style a large amount of valuable information on the general subject of surgery in war is made available to those medical officers who have previously lacked actual surgical experience in the field. The first section of the book deals with weapons used in war and wounds produced by them; the second with the aseptic healing of wounds and infection; the third with asepsis, antisepsis and disinfection in the field; the fourth with surgical dressings; the fifth with general pathological conditions and their treatment in the field; the sixth with the relief of pain in war; the seventh with the removal, disposition, and care of wounded in war; the eighth with the diet of the soldier; the ninth with medico-military transport and with military medicine and surgery in general. These foregoing chapters make up the first part of the book. The second part is more specific in its concept in that it deals with gunshot wounds and wounds from other explosive sources (Schussverletzungen). The first chapter relates to gunshot wounds of the skull and is followed in succession by "Gunshot wounds of the face," "Gunshot wounds of the neck," "Gunshot wounds of the chest," "Gunshot wounds of the abdomen and pelvis," "Gunshot wounds of the uro-genital system," "Gunshot wounds of the spine and individual vertebrae," and "Gunshot wounds of the extremities." The volume is well illustrated, excellently arranged, and very adaptable to the use of the military surgeon under conditions of active campaign. A. N. Taskeb.

Papers From the Mayo Foundation for Medical Education and Research and the Medical School, II, 1921–1922. 8°, 716 pp. Philadelphia and London: W. B. Saunders Company, 1923.

The second volume of papers from the Mayo Foundation and from the medical school of the University of Minnesota suggests in the wide variety of subjects with which it deals a day's shipment of literature—medical, surgical, psychological, genetic, sociological, and generally scientific—as received by the Surgeon General's Library. A few titles culled at random will serve to illustrate the foregoing statement:

1. A study of the pathological conditions encountered during and following the relief of experimental obstructive jaundice compared with similar pathologic conditions in man.
2. Actinomycosis of the gastro-intestinal tract. A study of fourteen cases.
3. The extension of hypernephroma by way of the renal vein.
4. Partial spontaneous inversion of a diverticulum of the bladder with dumb-bell stone.
5. Emphysema of the scrotum, the result of diverticulitis of the sigmoid with perforation.
6. The morphologic histology of adenocarcinoma of the body of the uterus in relation to longevity. A study of 186 cases.
7. Studies in basal metabolic rate.
8. Studies in diabetes insipidus, water balance, and water intoxication.
9. Destruction of transfused blood in normal persons and in patients with pernicious anemia, and its significance in the explanation of the anemia of pernicious anemia and of normal blood destruction.
10. The globulin content of blood serum in syphilis.

11. A study of microlymphoidocytic leukemia.

12. A study of the S-T interval in one thousand twenty-eight electrocardiograms.

13. A report of five cases of so-called acrodynia.

14. Morphometry of the human foetus with special reference to the measurements of the head.

15. Lipemia retinalis. Report of three cases.

16. Elephantiasis. A clinical review and an attempt at experimental reproduction.

17. Report of a case of loose osteocartilaginous bodies in the knee-joint.

18. Diagnosis of tumors of the cauda equina, conus and epiconus medullaris: report of eight cases.

19. The phenomena of Raynaud's Disease.

20. Ortho-diethylaminocyclohexanol Ester of para-aminobenzoic acid.

21. Concentration of urea in saliva.

22. The oxygen content of mediums in relation to surface tension and bacterial growth.

23. A consideration of the laws of heredity and their application to various conditions in man.

24. The growth of the organs and systems of the single comb white leghorn chicken.

25. The organization of medical schools and hospital facilities for graduate medical education.

26. A technique for the establishment of a permanent pancreatic fistula with the secretion of inactive proteolytic ferment.

27. A muscle clamp to be used in thyroidectomies.

The book is very adequately illustrated, contains many valuable bibliographies, and is of highest quality in the matter of printing, paper and other physical characteristics. A perusal of the whole volume will be found almost to constitute a liberal education in medicine and surgery, their allied sciences, and their various disciplines and specialties.

A. N. Tasker.

Précis de Pathologie Médicale; Tome II, Maladies de l'Appareil Respiratoire, by Fernand Bezançon, Professeur à la Faculté de Medecine de Paris, Médecin de l'hôpital Boucicaut, and S. I. de Jong, Médicins des Hôpitaux de Paris. 8°, 566 pp. Paris: Masson et Cie, Éditeurs, 1923.

This is one of six volumes which are destined to comprise a "System of Medical Pathology." The present volume is concerned with diseases of the respiratory system and has been entirely written by Professor Fernand Bezançon and Dr. S. I. de Jong. These gentlemen have long been looked upon as authorities in diseases of the respiratory apparatus. They have condensed the results of their numerous labors, but they have not failed also to include the results of research conducted by other workers. Thus constituted, this book will be found of value for the instruction not only of the medical student but of the practising physician as well. After several pages given up to the anatomy, physiology, and pathology of the air passages, the special diseases of the individual segments of the whole system are taken up methodically. Thus bronchitis, dilation of the bronchi, asthma, emphysema, etc., are considered in a particularly precise and thoroughgoing

fashion. The subject of tuberculosis is subdivided into: (*a*) The first tubercular infection; (*b*) Tuberculosis of the infant; (c) Lymphatic and pulmonary tuberculosis in children; and (*d*) Pulmonary tuberculosis of the adult. Each subdivision is considered from the point of view of its pathology, its diagnosis, and its treatment. The work is concluded with a discussion of pleurisy, pneumothorax, and diseases of the mediastinum, including the tracheobronchial adenopathies.

ARTHUR N. TASKER.

MEDICAL BACTERIOLOGY, by John A. Roddy, M.D., Associate in Hygiene and Bacteriology, Jefferson Medical College; Chief Assistant, Department of Clinical Medicine; Jefferson Hospital; Professor of Hygiene and Bacteriology, Philadelphia College of Pharmacy; Sometime Serologist to the Philadelphia General Hospital; Major, Medical Section, O.R.C., U.S.A. Philadelphia: Blakiston's Son & Company.

This work is intended as a laboratory guide for medical students and practitioners.

The physician who performs ordinary clinical bacteriological examinations will find this book of great value. The subject is covered fully and the descriptions of technical procedures are clearly set forth in the text.

The drawings and colored plates are exceptionally good and the book contains a sufficient number of these to fully illumine the text.

GEORGE F. LULL.

Front Row—Left to right: (1) Lt. Col. McKinley; (2) Capt. de Roulet; (3) Maj. Aron; (4) Col. Orr; (5) Col. Amerson; (6) Capt. Boyd; (7) Maj. Stackett; (8) Col. Eilen; (9) Col. Stayer; (10) Lt. Col. Furey; (11) Col. Comfort; (12) Col. Hawkin; (13) Brig. Genl. Finney; (14) Col. Duguet; (15) Brig. Genl. Martin; (16) Col. Visbecq; (17) Col. Lynch; (18) Maj. Genl. Ireland; (19) Col. Anderson; (20) Col. Cameron; (21) Capt. Piccininni; (22) Lt. Comdr. Tanaka; (23) Maj. Barre; (24) Col. Vinup; (25) Lt. Col. Reynolds; (26) Col. Sniveley; (27) Lt. Col. Cumming; (28) Col. Collins; (29) Brig. Genl. Griffith; (30) Col. Ford; (31) Dr. McCalloe; (32) Col. Seaman; (33) Col. Gist; (34) Dr. Brown.

Middle Row: (1) Maj. Tierney; (2) Lt. Col. Fager; (3) Mr. Womeldorph; (4) Maj. James; (5) Maj. Williams; (6) Maj. Leir; (7) Col. Conkling; (8) Capt. Marsh; (9) Capt. Sullivan; (10) Capt. Merchant; (11) Maj. Blair; (12) Maj. Sherman; (13) Maj. Woodard; (14) Maj. Reddy; (15) Maj. Carter; (16) Maj. Tuttle; (17) Dr. Marsh; (18) Maj. Coupal; (19) Capt. Buetiner; (20) Capt. Clifft; (21) Capt. Bogert; (22) Maj. Hume; (23) Capt. Carpenter; (24) Comdr. Bainbridge; (25) Capt. O'Connell; (26) Maj. Spranklin; (27) Capt. Ritterbush; (28) Lt. Reynolds; (29) Capt. Cross; (30) Capt. Blackwell; (31) Capt. Taylor; (32) Capt. Sankey; (33) Col. Doherty; (34) Maj. G. I. Jones; (35) Maj. Fletcher; (36) Maj. E. C. Jones; (37) Maj. McAfee; (38) Maj. Michie; (39) Capt. Tausey; (40) Maj. Stayer.

Back Row: (1) Capt. Hamstead; (2) Capt. Kelley; (3) Maj. Sprague; (4) Lt. Sawyer; (5) Capt. Lawson; (6) Capt. Taylor; (7) Maj. Worthington; (8) Maj. Triplett; (9) Lt. Mauser; (10) Maj. Fredericks; (11) Capt. Myers; (12) Maj. Tasker; (13) Maj. Dextre; (14) ——; (15) Maj. Hitchens; (16) Dr. Steindler; (17) Maj. Presnell.

529

THE
MILITARY SURGEON

VOL. 53 DECEMBER, 1923 NUMBER 6

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

PROCEEDINGS OF THE THIRTY-FIRST ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES, MEDICAL FIELD SERVICE SCHOOL, U. S. ARMY, CARLISLE BARRACKS, PENNSYLVANIA, OCTOBER 4 TO 6, 1923.

SHORT HISTORY OF CARLISLE AND CARLISLE BARRACKS

The town of Carlisle came into existence about January 27, 1750, when the western portion of Lancaster County was made into a new county called Cumberland, and Carlisle became the county seat.

About the year 1769, two persons, who were destined to become the most famous citizens Carlisle ever had, took up their residence in Carlisle. One was James Wilson, who came to Carlisle to practice law at the age of 26 years. The other was Mary Ludwig, afterwards renowned as "Mollie Pitcher." Wilson was one of the immortals who signed the Declaration of Independence. Mollie Pitcher gained undying fame at the Battle of Monmouth by carrying water to the thirsty soldiers in a pitcher and also by acting as a gunner in a battery. Her remains rest in the old graveyard in Carlisle.

The site of Carlisle Barracks was selected in the first years of the Revolutionary War as a military rendezvous and encampment. The barracks were built in 1777 chiefly by Hessian prisoners captured at Trenton. They were occupied by troops during the Revolutionary War and during the War of 1812. Major John Andre, who was executed as a British spy, was confined at Carlisle Barracks in August, 1776.

About December, 1776, action was taken by the Continental Congress looking to the erection at Carlisle of a magazine for arms and gunpowder and laboratory adjacent to the magazine. The guard house, which was built by the Hessian prisoners and which is still standing, was originally built for a powder magazine.

The post was used as a recruit depot from May, 1838, until October 31, 1879.

During the Civil War, Camp Biddle was maintained at Carlisle Barracks, and on the night of July 1, 1863, Gen. Fitzhugh Lee, of the Confederate Army, burned the principal buildings of the barracks, but the place was again occupied by the Union forces about July 11, 1863.

On June 23, 1879, the War Department transferred the Carlisle Army Post temporarily to the Interior Department for the purpose of establishing a school for Indians. Captain Pratt, a regular army officer, arrived in Carlisle on October 6, 1879, and established the Carlisle Indian Industrial School with 136 pupils, later increased to 1,000.

The Indian School was closed in the spring of 1918 and the entire reservation was turned over to the Medical Department of the Army to be used as a general hospital and designated U. S. Army General Hospital No. 31.

By the end of the World War, the need and usefulness of a field service school for the Medical Department as a step in the education of the officers of the Regular Army and the Citizen Army was so apparent that the Surgeon General succeeded in establishing on June 30, 1920, at Carlisle Barracks, the present Medical Field Service School. On May 27, 1921, the first class of student officers started instruction at the school.

MINUTES OF THE MEETING

The Thirty-first Annual Meeting of The Association of Military Surgeons of the United States convened at the Medical Field Service School, Carlisle Barracks, Pennsylvania, October 4, with Col. Charles Lynch, Medical Corps, U. S. Army, presiding.

FIRST SESSION, 9.30 A. M. OCTOBER 4

Business meeting for members.

The object of this brief meeting was to dispose of certain routine matters which must necessarily be considered by the Association but which were of no interest to delegates and guests.

Report of the Executive Council

During the period October 12, 1922, to October 4, 1923, there were six meetings of the Executive Council, as follows: October 27, 1922; January 10, 1923; March 14, 1923; May 16, 1923; September 6, 1923; October 3, 1923.

Report of Secretary-Treasurer

To the President and Members of the Association of Military Surgeons of the United States:

I have the honor to submit herewith report of the activities of the Office of Secretary-Treasurer for the period from October 1, 1922, to October 1, 1923. During this period the office was held from October 1, 1922, until his death on August 28, 1923, by Col. James Robb Church, U. S. Army, Retired. At a called meeting of the Executive Council held by order of the president on September 6, Major Edgar Erskine Hume, Medical Corps, U. S. Army, was appointed by the president upon the authorization of the Executive Council to fill the office until the next annual meeting of The Association.

During the year ending October 1, 1923, 61 new members were added to the roster of The Association, and 133 former members, who had for one reason or other dropped their membership, were reinstated.

The thanks of the Association are due to the many members who have by their personal efforts brought officers of the three services into the Association, and it is earnestly hoped that these efforts will be continued. The policy of the late Colonel Church regarding The Military Surgeon, as stated by him at the last annual meeting, has been continued, that is, attempt was made to cut down the length of articles and to publish a greater number with a greater variety, thereby insuring in every issue of the magazine something of interest to each of the readers of the journal. It is believed that the value of The Military Surgeon may be increased by including in each issue abstracts of articles appearing in the medico-military journals of foreign countries, all of which are available in the Army Medical Library. It is also believed that certain changes in the cover, paper and policy as to illustrations of The Military Surgeon may be made to advantage.

The present Secretary regrets that he is unable to give a more detailed report of the activities of the office prior to the death of our distinguished former Secretary, Colonel Church.

The thanks of the Secretary, the Executive Council and the members of the Association are due Mr. Stuart E. Womeldorph for his untiring efforts and devotion to duty in his work as business manager of the Association.

The following is a statement of the financial affairs of the Association for the period covered by this report:

Receipts

Admission fees, including reinstatements	$972.00
Annual dues	8,417.50
Subscriptions	1,171.78
Advertising	6,578.75
Miscellaneous	3,737.11
Total	$20,877.14
Cash Balance, October 1, 1922	524.34
Grand total	$21,401.48
Less disbursements	20,652.41
Cash balance October 1, 1923	$749.07

Disbursements

Printing journal	$11,162.09
Salaries	4,372.00
Reprints	2,314.99
Expenses of annual meeting, 1922	110.65
Stationery	570.03
Telephone	74.55
Postage	1,015.52
Miscellaneous	1,032.58
Total	$20,652.41

Assets October 1, 1923

U. S. Bonds, Third Liberty 4¼ Converted	$15,000.00
U. S. Bonds, Fourth Liberty 4¼	4,000.00
Deposit Union Trust Company, Washington, D. C.	250.88
Deposit National Bank of Washington	749.07
Total assets	$19,999.95

Board of Award

The Board of Award for the Wellcome Prize Competition for 1923 consisting of Captain Dudley N. Carpenter, M. C., U. S. Navy, Lieut. Col. James M. Phalen, M. C., U. S. Army, and Major James F. Coupal, M. C., U. S. Army, reported the following findings:

First Prize: "Benefits Derived by Military Medical Science from Animal Experimentation."

The First Prize, a Gold Medal and $300, was awarded to the essay under the *nom de plume* of "Veritas Praevalebit," the vote of the Board being unanimous.

Honorable Mention, which carries Life Membership in the Association of Military Surgeons, was awarded to the essay under the *nom de plume* of "Francis Madison," the vote of the Board being unanimous.

Second Prize: "The Training of the Medical Student for Service in Time of War."

The Second Prize, a Silver Medal and $200, was awarded to the essay under the *nom de plume* of "Sigma, Sigma, Sigma," the vote being two votes out of three for first place and one vote for second place.

Honorable Mention, which carries Life Membership in the Association of Military Surgeons, was awarded to the essay under the *nom de plume* of "Conjugo," the vote being two votes out of three for second place and one vote for first place.

The essays submitted by other authors will be returned to the writers in accordance with the procedure of the past.

The President of the Association now opened the sealed envelopes marked with the *nom de plumes* of the competitors and announced the following winners of the prizes.

First Prize: Gold medal and $300—Lieut. Colonel Edward B. Vedder, M. C., U. S. Army.

Honorable Mention and Life Membership in the Association: Major Edward G. Huber, M. C., U. S. Army.

Second Prize: Silver Medal and $200—Lieut. Colonel Henry H. Rutherford, M. C., U. S. Army.

Honorable Mention and Life Membership in the Association: Major Glenn I. Jones, M. C., U. S. Army.

The essays of Lieutenant Colonel Vedder and Lieutenant Colonel Rutherford were printed in the November number of The Military Surgeon. Those of Major Huber and Major Jones will appear in an early issue.

Upon motion, duly seconded, these reports were accepted and ordered spread on the minutes of the meeting.

The report of the Necrology Committee was next presented, this report showing that twenty-nine members had died since the 1922 meeting. The report was received standing.

Necrology Report

List of our members whose deaths have been noted since our last meeting:

Lieut. Col. Harold Barclay, M. C., U. S. Army.
Col. Alfred E. Bradley, M. C., U. S. Army.
First Lieut. Phil B. Brooks, M. R. C., U. S. Army.
Capt. Edwin T. Bruce, M. R. C., U. S. Army.
Major Daniel S. Burr, M. C., N. Y. N. G.
Col. James Robb Church, U. S. Army, Ret.
Major John H. Claibourne, M. C., N. Y. N. G.
Capt. Alex. R. Craig, M. R. C., U. S. Army.
Major Jos. R. Culkin, M. C., U. S. Army.
Capt. Jesse S. de Muth, M. R. C., U. S. Army.
Major F. C. Floeckinger, M. C., Texas N. G.
Capt. Robert M. Funkhouser, M. R. C., U. S. Army.
First Lieut. Michael H. Gleason, M. C., U. S. Army.
Major John J. Goodwill, M. R. C., U. S. Army.
First Lieut. Homer B. Haile, M. R. C., U. S. Army.
Capt. Erasmus G. Hopkins, M. R. C., U. S. Army.
Capt. John L. Ireland, M. C., U. S. Army.
Major Wm. S. Lawrence, M. C., U. S. Army.
Major Guthrie McConnell, M. R. C., U. S. Army.
Capt. Samuel R. W. McCune, M. C., U. S. Army.
Major Percy Musgrave, M. R. C., U. S. Army.
A. A. Surg. Henri L. Pache, U. S. P. H. S.
Major A. D. Parce, M. C., U. S. Army.
Capt. Geo. W. Pattison, M. C., N. Y. N. G.
Lieut. Col. Henry Ritchings, M. C., Ill. N. G.

Capt. M. H. Simons, M. C., U. S. Navy, Ret.
Lieut. Col. C. E. Sutphen, M. R. C., U. S. Army.
Major Herman Tuholske, M. C., Mo. N. G.
First Lieut. John C. Whiteaker, M. R. C., U. S. Army.

The president, Colonel Lynch, then appointed the following Committees:

Nominating Committee: Col. H. P. Birmingham, U. S. A., Ret.; Capt. E. S. Bogart, M. C., U. S. N.; Col. F. H. Vinup, M. C., Maryland N. G.; Surg. W. H. Marsh, U. S. P. H. S.

Auditing Committee: Col. J. H. Ford, M. C., U. S. A.; Capt. D. N. Carpenter, M. C., U. S. N.

Committee on Resolutions: Brig. Genl. J. D. Griffith, Missouri N. G., Ret.; Col. W. S. Conkling, M. C., Iowa N. G.; Major James F. Coupal, M. C., U. S. A.

Colonel Seaman of the Wisconsin National Guard, moved that a Special Committee on Membership among the National Guard medical officers be appointed at this meeting and suggested that Colonel Vinup of the Maryland National Guard be made chairman of the committee. The motion was seconded by Colonel Conkling and carried.

A motion by Colonel Vinup that the same action be taken with respect to the Medical Officers' Reserve Corps was seconded by General Griffith and carried. The president stated that, with permission of the meeting, he would appoint these two committees later.

Subsequent to the meeting, the following officers were appointed by the president of the Association members of the National Guard Committee on membership:

Col. F. H. Vinup, M. C., Maryland N. G., *Chairman.*
Col. Chas. W. Comfort, M. C., Connecticut N. G.
Col. L. A. Salisbury, M. C., New York N. G.
Col. H. H. Snively, M. C., Ohio N. G.
Col. G. C. Amerson, M. C., Illinois N. G.
Col. W. S. Conkling, M. C., Iowa N. G.

The following officers were appointed members of the Medical Officers' Reserve Corps Committee on membership:

Col. Seale Harris, M. C., U. S. A.
Col. Enoch M. Mason, M. C., U. S. A.
Col. Jos. M. Greer, M. C., U. S. A.
Col. Clarence E. Yount, M. C., U. S. A.
Col. Walter H. Bruce, M. C., U. S. A.
Col. Harry X. Cline, M. C., U. S. A.
Col. Philip S. Doane, M. C., U. S. A.
Col. Alexius A. Forster, M. C., U. S. A.
Col. H. W. Hoagland, M. C., U. S. A.

Col. John S. Lambie, Jr., M. C., U. S. A.
Col. Ansel G. Cook, M. C., U. S. A.
Col. John S. Dye, M. C., U. S. A.
Major Ralph N. Greene, M. C., U. S. A.
Col. Frank K. Boland, M. C., U. S. A.
Col. Wm. B. Crawford, M. C., U. S. A.
Col. John W. Daniel, M. C., U. S. A.

The meeting then adjourned until 10.15 a. m.

SECOND SESSION, 10.15 A. M.

The meeting was called to order by the president. After a selection by the Post Band, Colonel Lynch introduced Lieut. Col. Charles R. Reynolds, M. C., U. S. Army, Commandant of the Medical Field Service School, who spoke as follows:

Address of Welcome

Mr. President, Delegates and Members of the Association: When the Association of Military Surgeons accepted the invitation of the Surgeon General of the Army to meet at Carlisle Barracks, it offered an opportunity to make this meeting a reunion of former medical officers and to invite attention to the work of the Medical Field Service School in its devotion to the interests of the medical officers of the Regular Army and those of the National Guard and Officers' Reserve Corps.

The program arranged is not a professional one, but is designed to exhibit the progress made in medical preparedness with which the Association of Military Surgeons is so vitally concerned.

The honor and pleasure that is ours in having you with us will be expressed by the officers and the ladies of the garrison in a warm and sincere welcome.

Col. Charles Lynch, M. C., U. S. Army, President, next addressed the meeting as follows:

President's Address

It is not my purpose to make a formal address. The program of this meeting is a very full one, of novel interest in many respects, and I am sure your time can be much better occupied with it than in listening to commonplaces on my part.

I cannot let the occasion pass, however, without, as President of the Association, adding my word of welcome to those already said by the Commandant of the school where we are so fortunate as to meet today. Not only are we fortunate in meeting here, but it is peculiarly appropriate that we should do so, for the purposes of the school and of the Association are identical—that is, with both they are the better training and education of medical officers. I am sure we are all agreed that with the complexities of modern warfare at the very best we must inevitably fall far short in the way of properly trained medical officers. Both school and the Association in different ways have the basic object of remedying this defect so far as within them lies.

We have with us today many distinguished officers from many nations, and their knowledge and experience must add greatly to the attainment of this object and to the value of this meeting. Moreover, the Surgeons General of our own federal medical services, or senior officers representing them, are present, and we all depend upon them to inform us in each case of the present status and aspirations of their own particular service. In a few moments we are to have the honor of hearing from them.

The program in this and in other particulars was arranged by the Commandant of the school, to whom our thanks are due as well as for countless other things which should make for a successful meeting. From what has just been said you might conclude that the duties of the President of the Association have been of no very onerous nature during the past year and that is quite true. Whatever may have made for success is due primarily to Colonel Reynolds, Colonel Church and Major Hume, the late and the present secretaries and executives of the Association. The death of the former was a great loss not only to the Association but to all of his friends, and all of us who knew him were his friends. He was a distinguished medical officer, a recipient of the highest honor which our government bestows—that of the Medal of Honor. And with valor in the field marked indelibly by the award of this medal, he combined long practical experience and literary gifts of a high order which he freely contributed to this Association, despite physical handicaps which would have prostrated many men. His sudden death threw an unexpected burden on the present secretary, Major Hume, who immediately volunteered his services in any capacity in which they could be made of use to the Association. His offer was at once accepted, and he was elected as acting secretary by the Executive Council.

A sincere word of thanks is also due to all the officers who constitute the staff of this school. Not only have their arrangements extended to professional affairs but they have been equally active on the social side. Perhaps for the latter I should rather express our appreciation to their wives, and I gladly do so both jointly and severally. The social has always, in its best days, constituted an important characteristic of our meetings. The friendships so formed have been a great factor in uniting us into a brotherhood. Our universal practice has been, as early as possible in our annual meeting, to formally receive our foreign guests into the Association and into that brotherhood. This has been done by conferring on them the badge of the Association as a visible evidence that they have been made honorary members I am quite sure that this has always proved one of the most pleasant duties of the president. Again welcoming all of you, I will ask the secretary to play his part in the ceremony, sanctioned by the practice of many years.

Presentation of the Badges of Honorary Membership

The secretary presented the badge of Membership to the following officers in token of their election to honorary membership in the Association:

Col. Kenneth Cameron, C. M. G., Canadian Army Medical Corps, representing Canada.

M. le Medecin Principal de 1ère Classe Fernand Maximilien Hippolyte Visbecq, Chef de la Section Technique du Service de Santé et Secretaire du Comité Consultatif de Santé; M. le Medecin Principal de 1ère Classe Marie Louis Firmin Duguet, Professeur a l'Ecole d'Application du Service de Santé Militaire, Val-de-Grace, representing France.

Lieut. Col. John Allan Anderson, Royal Army Medical Corps, Professor of Hygiene at the Royal Army Medical College, representing Great Britain.

Lieutenant Commander Asazo Tanaka, Medical Corps, Imperial Japanese Navy, representing Japan.

Major Carl Barre, Royal Medical Corps, Swedish Army, representing Sweden.

Capt. Surgeon Francesco Piccininni, Royal Italian Army, Professor of Bacteriology of the University of Naples, representing Italy.

Lieut. Col. Naohide Nakayama, Medical Corps, Imperial Japanese Army, had been designated by his government to represent the Japanese Army at the meeting but was unable to be present, because the steamer upon which he was to have sailed from Japan was scheduled off as a result of the earthquake catastrophe. The Association was accordingly notified by the Japanese Government through the State Department that Lieutenant Colonel Nakayama was unable to be present.

Major Triplett of the Maryland National Guard addressed the Chair as follows: "Mr. President, from the Chair and in the reports mention has been made of the death of our late Secretary-Treasurer, Col. James Robb Church. Believing it fitting that special recognition should be taken, I move you, Sir, that a Committee be appointed to draft special resolutions expressing the regret of this Association."

This motion was duly seconded and carried, whereupon the Chair appointed the following Special Committee: Maj. Gen. M. W. Ireland, Surgeon General, U. S. Army; Colonel Gilbert E. Seaman, M. C., Wisconsin N. G.; Lieut. Col. Charles R. Reynolds, M. C., U. S. Army.

Colonel Lynch then introduced Major General M. W. Ireland, Surgeon General, U. S. Army, who spoke as follows:

Address of Major General M. W. Ireland, Surgeon General, U. S. Army

The Medical Department of the Army has been signally honored by having one of its schools selected as the place for convening this 31st Annual meeting of the Association of Military Surgeons of the United States.

As chief of the department I personally, as well as officially, bid you a most cordial welcome to this institution, which is devoted strictly to military education and in which we take so much pride.

I observe with feeling of extreme gratification the presence of delegates and distinguished guests from other countries. The participation of these gentlemen in our meetings is always deeply appreciated.

Our program this year will be a radical departure from former procedure. We hope it will prove interesting and profitable. Our time will be taken up chiefly by observing and discussing demonstrations to be conducted by the staff of the Medical Field Service School. In keeping with the traditions of this Association full inspection and constructive criticism are freely invited. The success of a school of this character is a matter of vital concern to every member of this Association. You will recall that Article II of the Constitution of the Association reads as follows:

"The object of the Association shall be to increase the efficiency of the medical service of the Army, the Navy, the Public Health Service, of the Organized Militia of the different states by mutual association and the consideration of matters pertaining to the medico-military service of the United States both in peace and war."

This school is typically representative of a new and most important era in medico-military preparedness. It is an outgrowth of our experience in the World War. You will see here what the Medical Department of the Army is attempting to do in the way of educating its personnel in the duties that devolve upon it in the field. The school is open not only to members of the military establishment—and by "military establishment" I mean the National Guard and Organized Reserves as well as the Regular Army—but also to those of all other services concerned with national defense. In the past we have numbered among our students medical officers of the Navy and from several foreign governments.

All of our special field training has been concentrated at this place, while the strictly technical or postgraduate professional instruction of our officers is conducted at the Army Medical Center at Washington. It can safely be asserted that never before in the history of the Army has medico-military education been conducted on so high a plane of efficiency.

This satisfactory condition of affairs can be chiefly attributed to the new military policy enacted by the Congress in 1920. When our plans have been finally consummated medico-military preparedness for any eventuality of the future, as far as the Medical Department of the Army is concerned, will have reached a state of perfection hitherto undreamed of. We have taken the lessons of the World War to heart. With its successes and failures still fresh in mind we are striving to derive a full measure of profit and avoid the mistakes and pitfalls of the past. Accordingly, as a peace-time measure we are working out a comprehensive program that will assure us, for any war involving a maximum effort, an adequate and expeditious procurement of supplies, equipment, and personnel. It will be remembered that, save for the fifty base hospitals organized by the Red Cross prior to our entry into the World War, all of our Medical Department units had to be organized from green material after our country became an active participant in the war. This involved a tremendous task at our training camps

and in large measure obviated the use of personnel in positions for which they were best fitted. Under our present plan the necessity for this will have been entirely eliminated in any emergency of the future.

We are now proceeding with the organization, in so far as the officer personnel is concerned, of all the surgical hospitals, evacuation hospitals, general hospitals, laboratories, supply depots, and hospital trains to be needed by the military forces in a general mobilization of man power. The personnel to man these units must be obtained almost exclusively from members of the civil profession who are enrolled in the Reserve Corps. In forming and allocating these units the cooperation of medical schools, hospitals, county and state medical societies is being solicited. I am prompted to mention these matters because, under our constitution, members of this Association are particularly interested in the medical phase of preparedness for national defense, and in carrying out our program I want to take advantage of this opportunity to enlist your aid. You can render the Medical Department of the Army invaluable assistance in two ways:

1. In addition to their strictly professional obligations, in caring for the sick and injured of our relatively small Regular Army, the members of the Medical Department of the regular establishment now have a very important training function to perform. Our complement of officers must be maintained at the maximum authorized strength. If we are properly to assist in the training of the National Guard and Organized Reserve components of the Army, vacancies in the regular service incident to deaths, retirement and resignation must be filled as rapidly as they occur. Therefore, whenever the opportunity presents I hope that you will encourage recent graduates to seriously consider the proposition of joining the Medical Corps of the Regular Army as a career. I need not dwell upon a comparison of the rewards to be expected from service in civil life as contrasted with the Army. If not in worldly goods, life in the service is at least rich in interest and experience. If our usefulness in the training program of the country is not to be impaired, we must have replacements to offset our losses.

2. Furthermore, if we are to realize our ambition of organizing the many hundreds of units allocated to the Organized Reserves, we must get members of the civil professions to manifest a more active interest in the Reserve Corps. We already have about 6,000 enrolled, but for the completion of our program we need not less than 24,000 more. Here again you can perform a yeoman service. Many of you in conference here today are citizen soldiers already affiliated with the National Guard or the Organized Reserves. In your communities you are representative men and in your daily work and society meetings come in contact with many members of the profession who are still without the fold. Whenever an opportunity offers I hope that you will conduct a personal recruiting campaign in the interests of the Reserve Corps. Not only do we want to see enrolled many more World War veterans than we now have, but a large number of young practitioners. An enrollment in the reserve entails no obligations that even the busiest practitioner cannot meet. Training requirements are not irksome. We always have more volunteers for training than the appropriations will permit us to accommodate. Enrollment during time of peace

assures the applicant proper classification, assignment, and promotion—features that cannot be guaranteed him if he awaits the advent of war before joining the colors. In time of war the American medical profession has never failed the country's call, and when our need becomes more generally known and its true significance is fully recognized, I am sure it can be relied upon to do its part in this peace-time development of our preparedness program.

Therefore, as a means in attaining our objective, let me urge upon you to keep this project fresh in mind and arouse a more active interest in our vitally essential Reserve Corps.

In conclusion, let me add that this problem of procuring officer personnel in time of peace is not peculiar to the Army alone. The Navy and the Public Health Service are also concerned in its solution. With a helping hand from you and a generous response on the part of the civil professions the medical services, who are your representatives, will be better prepared for any war of the future than they have ever been in the past. Let us remember also that in building for the future we are actuated by a most humane motive—the mitigation of the suffering and horror incident to war.

Capt. E. S. Bogert, M. C., U. S. Navy, representing Rear Admiral E. R. Stitt, Surgeon General, U. S. Navy, was next introduced by the president of the Association. Captain Bogert addressed the meeting as follows:

Address of Captain E. S. Bogert, M. C., U. S. N., Representing the Surgeon General of the Navy

Mr. President, Ladies and Brother Officers: Our president has introduced me as representing Admiral Stitt and, as I am a most unworthy representative of that distinguished officer, I know that you will be pleased to learn that I have no special message to deliver and that I shall therefore detain you but a few minutes from witnessing practical demonstrations to which we are looking forward with so much interest.

It so happens that I am somewhat familiar with the excellent work which is being done at this school, and I am sure that the practical demonstrations of this work, scheduled for our consideration, will be most enjoyable, interesting, and profitable to all of us. My information on the work of this school is due to the happy cooperation existing between the Medical Departments of the Army and the Navy, and the courtesy of Surgeon General Ireland and the War Department, whereby participation in the work of this school, the Flight Surgeons' School, and the Gas Warfare School is authorized to members of the Naval Medical Corps.

The Navy is deeply indebted to the Army for this opportunity to profit from the thorough and excellent courses given at these schools. Our president has referred to navy medical officers as perhaps indicating that they are not military surgeons and are not interested in field work. As the Medical Corps of the Navy provides all medical personnel and equipment for the marines, we are very much interested in this subject.

In fact, we have at this moment some twenty-eight officers and over two hundred hospital corpsmen engaged in a hike across the State of Virginia with the marines. This hike has been under way for nearly a month and the personnel of this detachment is equipped with the individual carrying devices developed by Major Fletcher of this school (modified very slightly to comply with standard navy equipment) and is using the combat and electric lighting trail units as devised in this school. In fact, the Navy has purchased more of Major Fletcher's carrying devices than has the Army to date.

For the Navy, I may say that we are keenly interested in this association and its development. I regret that, owing to the exigencies of the Naval Service and our present limited number of officers, we are making such a poor showing in numbers present at this meeting, but I can assure you that Captain Carpenter and Commander Bainbridge represent respectively the best of our active and reserve officers. We realize that this Association was founded by National Guard and Reserve officers. Personally, I feel that the practical demonstrations scheduled for this meeting are especially interesting to the Reserve and National Guard offiers; that articles in the journal introducing practical problems and incidents of medical service are of more interest to our members than strictly professional articles; and that these presentations should be stressed in our activities.

The Navy is much interested in its reserve, and efforts to induce these officers to become members and to hold their interest in the Association shall be made.

Surgeon General Hugh S. Cumming of the United States Public Health Service had expected to be present, but at the last minute was unable to do so. The following telegram was received from him:

COLONEL CHARLES LYNCH:

Deeply regret absolutely impossible for me to leave Washington on account of urgent official business. Disappointed not having the pleasure of meeting with you.

CUMMING.

The Secretary reported that communications had been received from Governor Pinchot, Senator Pepper, Senator Reed, and Representative Sites, of Pennsylvania, and from Brigadier General de Schweinitz of Philadelphia, regretting their inability to be present at the meeting and conveying their greetings to the Association.

Colonel Duguet of the Service de Santé, French Army, next read a paper on "The General Organization of the Treatment and Evacuation of Wounded with Fractures, in the Area of the Front." This address was delivered in French, a translation of which appears elsewhere in this issue. After reading his paper, Colonel Duguet demonstrated the splints, samples of which he had brought with him. These appliances were presented to the Medical Field Service School on behalf of the French Government.

Following Colonel Duguet's paper, Colonel Visbecq of the Service de Santé, French Army, read two papers, the first of which was entitled "Statistical Data Relating to the French Medical Service during the War, 1914–1918." This paper was illustrated by a series of beautifully executed graphic charts prepared by the Technical Service of the Service de Santé at the French Ministry of War. The charts were presented to the Medical Field Service School and will prove of great value to the school for instruction purposes. Colonel Visbecq's second paper was on "Organization of the French Medical Service during the Operations of August, 1917, at Verdun: An historical Account." This paper also was illustrated by valuable charts which were likewise presented to the Medical Field Service School on behalf of the French Government. These papers appear elsewhere in this issue.

In thanking the French officers for their valuable contributions to the meeting, the president of the Association remarked that he considered these papers among the most valuable that had ever been presented at any meeting of the Association of Military Surgeons. He thanked the officers warmly for the preparation of these articles, which had required expenditure of much time.

The meeting then adjourned until 1.00 p. m.

THIRD SESSION

At one p. m. the members and visitors assembled on the Athletic Field, where new equipment for medical troops was demonstrated. Besides articles of individual equipment, there were shown the new veterinary ambulance, the portable Delco electric lighting unit, capable of generating sufficient current for a field hospital, the proposed new medical department combat wagon, the old combat wagon, standard ambulance, the mobile kitchen and the new ward tent, constructed without the troublesome center pole.

Following this demonstration, the guests were divided into three groups and conducted through the Medical Field Service School. The officer in charge of each department was present and discussed the methods of instruction employed in that department.

1. *Department of Hygiene.*—Major M. C. Stayer, M. C., U. S. Army, Professor of Military Hygiene, demonstrated the laboratory of his department and the models of sanitary devices. The following are some of the exhibits:

1. The laboratory of the Second Division which was used during the war. This was composed of material in six large boxes.

2. A German field laboratory, the material for which also was contained in six large boxes. It was demonstrated that with both of

these field laboratories it is necessary that all six boxes be opened in order to set up the laboratory. This involves considerable loss of time, in addition to which the boxes are large and cumbersome.

3. The new field laboratory was then demonstrated. This consists of 19 boxes and one crate. The laboratory is designed to solve the difficulties experienced in the late war with the old field laboratory. The material is divided as follows:

11 boxes and crate are assigned to the laboratory section of the medical regiment.
1 box to a hospital company.
5 boxes to an evacuation hospital.
5 boxes to a surgical hospital.
3 boxes to a convalescent hospital.
25 boxes to an Army Medical laboratory.
9 boxes to water analysis laboratory (engineer water transportation train).
1 box to water purification trench (Engineers).
22 boxes to the hospital center laboratory.
5 boxes to a general hospital in a hospital center.
15 boxes to a general hospital, independent.
3 boxes to a convalescent camp.
12 boxes to a station hospital.
1 box to a venereal segregation camp.

The boxes assigned to these various units contain the material most needed and, as the boxes are numbered and the contents of each listed, it is not necessary to open more boxes than are actually needed in order to perform the type of laboratory work required. The material in each of the boxes was shown to the delegates, attention being invited to the new method of packing with muslin, new devices, waterproof microscope case, small autoclave, automatic Wassermann baths, incubators, rubberoid containers, etc.

In another room the delegates were shown about one hundred models of sanitary devices which included incinerators (manure and garbage), grease traps, sullage water pits, urine pits, latrines, latrine boxes, kitchens, meat cages, refrigerators, fly traps, shower baths, disinfestors, etc. It was emphasized that the Department of Hygiene endeavors to teach the students by actually exhibiting to them devices and materials which they may be required to use in different situations. Questions regarding the various devices were answered and upon request any particular device was explained and demonstrated in detail.

2. *Department of Military Art.*—The sand tables as used in teaching this subject and relief maps of the terrain near Carlisle were demonstrated by Major T. E. Darby, M. C., U. S. Army, Professor of Military Art. At this time the problem to be demonstrated on the following

day was given out in order that those interested might study the general situation before going into the field.

Other departments demonstrated included the Department of Military Administration, Veterinary Department, Dental Department and the Administrative Offices of the School. Copies of the publication of the school such as are issued to the students were available for distribution, and those interested were given copies. Following is a partial list of the documents distributed:

1. Outline of the Basic Course given in 1923, for Medical, Dental, and Veterinary Officers of the Regular Army, and selected officers of the National Guard and Organized Reserves.
2. Synopsis of the Camp Course for the Reserve Officers' Training Corps.
3. Organization of the Sanitary Service in the Army.
4. Organization of the Sanitary Service in the Army Corps.
5. Outline for a Medical Sanitary Order to Govern a Division of Infantry or Similar Body of Troops.
6. The Medical Detachment with a Regiment of Infantry.
7. The Ambulance Battalion:
   (*a*) Object.
   (*b*) Organization.
   (*c*) Interior Organization.
   (*d*) Function.
   (*e*) General Training.
   (*f*) Special Training.
8. The Hospital Company:
   (*a*) Introduction.
   (*b*) Composition.
   (*c*) Internal Organization.
   (*d*) Function.
   (*e*) General Training.
   (*f*) Special Training.
   (*g*) The Hospital Station.
   (*h*) The Hospital Station, Sorting.
   (*i*) Loading Tables.
9. The Ambulance Company, Animal Drawn:
   (*a*) Object.
   (*b*) Organization.
   (*c*) Interior Organization.
   (*d*) Function.
   (*e*) General Training.
   (*f*) Special Training.
10. The Ambulance Company, Motor:
   (*a*) Object.
   (*b*) Organization.
   (*c*) Interior Organization.
   (*d*) Function.
   (*e*) General Training.
   (*f*) Special Training.

11. The Ambulance, Animal Drawn.
12. The Ambulance, Motor Drawn.
13. Motor Convoys.
14. The Sanitary Battalion:
    (*a*) Object.
    (*b*) Organization.
    (*c*) Interior Organization.
    (*d*) Function.
    (*e*) General Training.
    (*f*) Special Training.
15. The Sanitary Company:
    (*a*) Introduction.
    (*b*) Composition.
    (*c*) Internal Organization.
    (*d*) Function.
    (*e*) General Training.
    (*f*) Special Training.
    (*g*) The Litter Bearers' Section.
    (*h*) The Collection Station Section.
    (*i*) The Sanitary Company at Station.
    (*j*) Sanitary Squads.
    (*k*) Loading Table.
16. Demonstration of the Recruit.
17. Demonstration of Purification of Water.
18. Demonstration of the Individual Equipment for the Enlisted Man Medical Department (Mounted), and the Full Pack (Mounted).
19. Sanitary Conditions in Forward Areas.
20. The Military Ration.
21. Sanitation of Bivouac and Camps:
    (*a*) Types of Camp.
    (*b*) Selection of Camp Sites.
    (*c*) Water Supply.
    (*d*) Arrangements on Arrival of Troops in a Camp.
    (*e*) Kitchens.
    (*f*) Mess Halls.
    (*g*) Refuse Disposal.
    (*h*) Ablution Places.
    (*i*) Baths in Camp.
    (*j*) Drying of Clothes.
    (*k*) Disposal of Waste Water.
    (*l*) Disposal of Dead Animals.
    (*m*) Manure.
    (*n*) Prophylactic Station and Infirmary.
22. The Hygiene of Moving Troops:
    Marching and March Hygiene.
    Marching Conditions:
        (*a*) Distances.
    Speed and Duration.
    Rhythm.
    Marching Rhythm:
        (*a*) Halts.

(*b*) Hours.
(*c*) Order.
(*d*) Clothing.
(*e*) Food:
1. Before Starting.
2. On Reaching Camp.

Rolling Kitchens and Hot Boxes.
Water:
(*a*) Water-discipline.
(*b*) Normal Needs.
(*c*) Normal Routine.

Special Arrangements for Highly Mobile Mounted Troops.
Care of Feet:
(*a*) Shoes.
(*b*) Socks.

Sanitary Squads.
Troop Movement by Water.
Sanitary Regulations of a Transport:
(*a*) Before Embarkation.
(*b*) After Embarkation.

Troop Movement by Rail.

23. The Litter:
(*a*) General Consideration.
(*b*) Drill with Unloaded Litter.
(*c*) Drill with Loaded Litter.
(*d*) To Pass Obstacles.
(*e*) Moving Patients without Litter.
24. Pitching, Striking and Folding Heavy Tentage:
(*a*) Ward, Pyramidal and Wall Tents.
25. Pitching, Striking and Folding of all Hospital Tentage:
(*a*) The Ward Tent.
26. Shelter Tent Drill.
27. Doctrine, Principles and Method of Training.
28. The Medical Laboratory Section:
(*a*) General Provisions.
(*b*) Administration, Organization and Personnel.
(*c*) Functions.
(*d*) Equipment.
(*e*) Transportation.
(*f*) Messing.
(*g*) Formation.
29. Medical Supply Section:
(*a*) Object.
(*b*) Organization.
(*c*) Interior Organization.
(*d*) Functions.
(*e*) General Training.
(*f*) Loading Tables.
30. Form for Sanitary Inspection. This is divided into
(*a*) Tents.
(*b*) Kitchens.

(*c*) Storage and Care of Food.
(*d*) Water Supply.
(*e*) Garbage.
(*f*) Latrines and Urinals.
(*g*) Picket Lines.
(*h*) Physical Inspection.

31. Demonstration of March Regime, Camp Sanitation Order and Sanitary Devices for Camps.
32. Score Card for Dairies.
33. The Prevention of Venereal Disease.
34. Outline for the Investigation of an Outbreak of Food Poisoning.
35. Cause and Prevention of Intestinal Diseases.
36. Insects and Their Relation to Military Hygiene.
37. Insect Borne Diseases, Their Causes, Prevention and Control.
38. Respiratory Diseases and their Prevention.
39. Preventive Measures for Some Other Communicable Diseases.
40. Demonstration of Waste Disposal:
    (*a*) Excreta.
    (*b*) Kitchen Sullage.
    (*c*) Garbage.
    (*d*) Bath and Waste Water.
41. Military Map Reading and Sketching, with a number of practical exercises and contour problems.
42. Demonstration of Food Supply:
    (*a*) Quartermaster Store House.
    (*b*) Dairy.
    (*c*) Pasteurization Plant.
43. Duties of a Dental Officer and His Relation to Medical Officers.
44. Oral Hygiene.
45. First Aid for Fractured Jaws.
46. Lectures on Commercial Law.
47. Epitome of the Manual for Courts-Martial.

At 5 p. m. there was a parade and review by the Commandant of the School, the Surgeon General of the Army, representatives of the Army and Navy Nurse Corps, the foreign delegates to the meeting and the officers and members of the Association. Immediately following the review, Brig. Gen. John M. T. Finney, Medical Officers' Reserve Corps, U. S. Army, Professor of Surgery at the Johns Hopkins University. unveiled a bronze tablet[1] commemorating the services of the Officers,

[1] This tablet is a duplicate of that placed in the new Army Medical School building at Walter Reed Hospital, Washington, D. C., the necessary funds being received by popular subscription. A photograph of the tablet was given in THE MILITARY SURGEON for October, 1922, page 417. The inscription on the tablet is:

IN MEMORY
OF THE
OFFICERS, NURSES
AND ENLISTED MEN
OF THE
MEDICAL DEPARTMENT
UNITED STATES ARMY
WHO LOST THEIR LIVES
DURING THE
WORLD WAR
THIS TABLET IS ERECTED
BY THEIR COWORKERS OF
THE MEDICAL DEPARTMENT

Nurses and Enlisted men of the Medical Department who lost their lives during the World War. General Finney's address follows.

General Finney's Address

We are gathered here today to pay homage to those of our comrades and friends who, during the World War, laid down their lives in the cause of justice and liberty, and to unveil this beautiful tablet of bronze erected to perpetuate their memory. It is fitting that we should pause for a moment to consider just what their supreme sacrifice has meant to the world, to our country and to ourselves We should not forget that these, our honored dead, represent but an infinitesimal fraction of that great multitude of those "whom no man can number," who, during the World War, laid down their lives willingly—yes, gladly—for the cause of freedom, justice and honor, as opposed to dishonor, frightfulness and force. Multiply our feelings of loss, our heartaches and yearnings for those who are gone never to return, by those of that vast throng of other races and tongues who mourn as we do now, and try, if you will, to comprehend the measure of it all—the extent of grief, the sense of loss, the ruthless destruction and wanton waste. Then think of the causes back of and responsible for it all—selfishness writ large, greed of gain, lust for power upon the part of one misguided nation led by a vainglorious, self-styled "inspired war-lord, now a fugitive from justice, a prisoner interned in a foreign land whither he had ignominiously fled to escape retribution. As a result of his madness, the whole world has been plunged into a state of chaos and confusion from which, up to the present moment, there has been found no safe and sure release.

What has been gained by all the suffering, the loss of life and limb and property, the social unrest, the international hates and suspicions, the lowering of moral standards, national and personal, that flow from wars such as this? Is there no lesson in it all for us who survive, for the nations of the earth, for our country? Have the sacrifices of these, our brave and heroic comrades, been made in vain? Is the world to become worse rather than better by reason of what they have suffered? Are the nations of the earth still to continue, in spite of international peace leagues and disarmament conferences and such like, to go on stealthily piling up their armaments, reconstructing and improving their various engines of war, and all the while manufacturing poisonous gases of still deadlier power, in order, when the favorable time comes, again to unleash the dogs of war? God forbid! Rather may we not hope with confident assurance that finally, by reason of the very sacrifices that have been made, the nations of the earth may come to see and to know, by actual experience, the truth of the ancient proverb, "righteousness exalteth a nation, but sin is a reproach to any people." The blessed heritage of the lives of these, our comrades in arms, the good fight that they have fought, the record of how well they have kept the faith, the memory of their splendid achievements cannot, it must not, fail to be a constant stimulus to higher thinking and better living to us who knew and loved them, and to those who shall come after us, until the end of time.

We, as present and former members of the Medical Corps of the Army, may well be proud of the part played by the men and women composing that important arm of the service during the late war. When the call came, the medical profession, as a whole, responded with commendable alacrity, and the whole-hearted devotion to duty and the remarkable efficiency manifested by them, as a whole, has reflected great credit upon our guild. What has just been said of the medical profession applies with equal force to all other departments of the service, but more especially, perhaps, to our sister profession of nursing. Nothing could have been finer than the way in which the nurses responded and volunteered for service, both in the field and in the hospitals, in this country and abroad. This splendid exhibition of patriotism was only surpassed by the unselfish devotion to the welfare of the soldiers, which at all times characterized their ministrations. And what could have been more inspiring than the splendid service rendered by the enlisted personnel of the Hospital and Sanitary Corps? The many instances of personal heroism performed by individual members of the entire Medical Corps furnish one of the most brilliant chapters in the history of the World War. Where the standard of excellence in the performance of duty was so uniformly high, it would be invidious indeed to try to make distinctions, to mention one group without the others. From the greater prominence of their position, the accomplishments of the commissioned officers were of such a character, perhaps, as to attract more general attention, and thus become more widely known. They speak for themselves. But those who were in a position to know the facts are very familiar with the splendid work done by the entire nursing corps of the Army, both in France and this country. The remarkable results achieved in the low mortality rate of the World War could never have been obtained without the hearty cooperation of that noble body of women who, as nurses, so freely gave their all to the care and attention of the sick and wounded. Many a doughboy who, wounded and ill and homesick in a foreign land, his sufferings relieved, his wants supplied, and himself nursed back to life and health by their ministrations, will "rise up and call them blessed." Their heroism so often displayed in the face of danger, their fortitude in undergoing hardships, and their unfailing cheerfulness through it all contributed more to the building up and keeping up of the high morale of the Army than can possibly be estimated. The wholesome effect of the very presence of the nurses in the hospitals and the fact of their eagerness to undergo the same hardships and dangers as their brothers in the trenches were most beneficial. The willingness to make the supreme sacrifice, if necessary, was well-nigh universal, and that some of them were actually called upon to make it is attested by the erection of this tablet.

Could anything be more heroic or worthy of higher praise than was the character of the services rendered by the enlisted men in the various branches of the Medical Corps? To go over the top, armed with rifle and pistol and other weapons of offense and defense, is one thing. But it was quite another to go over armed only with litter and splints and dressings and bandages, and to meet face to face a hostile foe,

reputed to pay little respect to the ordinary amenities of war, no more indeed than to "a scrap of paper." Their duty was to go to the aid of wounded comrades lying helpless upon the battlefield where the shot and shell were flying thickest, and in gravest peril of their own lives, to render aid and succor. How well they played their part is witnessed both by the high mortality rate among the enlisted medical personnel as well as by the comparatively low mortality rate of the Army as a whole. The long roll of names of enlisted men commemorated by this tablet speaks eloquently of their devotion to duty. When the history of the war comes to be written, the many deeds of unselfish valor performed by unknown heroes in the ranks will merit a large place.

The following facts concerning the important part played by members of the various branches of the Medical Corps during the World War may be of interest. There is some uncertainty as to who was the first officer to be wounded in action after we had entered the War. There is good reason to believe that the distinction belongs to the late Lieut. James Allen Etheridge, a graduate of Johns Hopkins Medical School, and, I am proud to say, one of my former pupils. As indicative of the kind of man he was, after having been discharged for disability as a result of his wounds, he later succeeded in having this disability waived and reentered the service, but, before he could accept his commission, he died of the "flu."

The first to be killed after our entry into the war were members of Base Hospital No. 5, one officer and three enlisted men. This hospital, while serving with the English, was bombed and suffered many casualties in addition to the four already mentioned.

The total number of officers of the Medical Department who died of wounds, disease, accident or other causes during the World War is divided among the several branches of the service as follows:

Medical Corps	326
Sanitary Corps	26
Dental Corps	43
Veterinary Corps	23
Ambulance Corps	2
	420

Officers of the Medical Department who died before being called into active service:

Medical Reserve Corps	25
Dental Reserve Corps	8
Veterinary Corps	1
	34

Number of nurses of the Medical Department who died in the service, of disease and other causes.....203

Number of enlisted men of the Medical Department killed or wounded in action, etc.:

Killed in action		412
Died of wounds received in action		260
Died of disease		4,089
Died from other causes		354
		5,115
Wounded in action, of whom 3 were nurses		970
Total killed and wounded		6,742

Five thousand seven hundred and seventy-two members of the Medical Corps, as a whole, made the supreme sacrifice, a truly remarkable record of devotion to duty.

It will be seen from these statistics obtained from the records of the Surgeon-General's Office that the Medical Corps suffered a higher percentage of casualties than did several divisions of the combat troops. The unprecedently low mortality rate of the World War speaks in loudest praise of the excellence of the service rendered by the Medical Corps of the Army, in all of its branches. This was the first war in history in which the number of those killed in battle and who died of wounds exceeded the number of those who died of disease.

But great as is the lesson to be learned from the self-denial and heroism and duty well performed by these our comrades, whose virtues we extol, yet, if I mistake not, there is another and even greater lesson for us to learn from their spirit of sacrifice and consecration. If any virtue goes out from occasions such as these, if any good is to come from them, it should be—it can only be—in the effect that they have upon those of us who remain. Paraphrasing the language of our great martyred President, used upon a somewhat similar occasion not many miles from here, "We cannot dedicate, we cannot consecrate this tablet. The brave men and women who struggled and died have consecrated it. It is for us, the living, rather to be dedicated here to the unfinished work which they have thus so nobly advanced; to rededicate ourselves to the great task remaining to be done; that from these honored dead we may take increased devotion to that cause for which they gave the last full measure of their strength: that we here highly resolve that these dead shall not have died in vain." That in spite of the selfish machinations of petty politicians posing as statesmen in high places, who are willing to put personal considerations above patriotism, politics above statesmanship, we will not be discouraged, but will continue to "carry on," as we believe these our devoted dead would have done, and, by the same token, would have us do. These same misguided politicians have, by their selfish, short-sighted policy, been responsible for the real tragedy of the war, namely, the failure of this country to assume and maintain its rightful place as the leader of the world in international righteousness.

The age-old question, "Am I my brother's keeper?" is still pressing for an answer, and will continue to do so until we, as a nation, are willing to abandon our selfish position of so-called "splendid isolation'

and take our rightful place in the councils of the nations, and accept our full share of responsibility, and exert our power and influence in the proper solution of the many problems so sorely perplexing the less fortunate nations of the earth. No question is ever really settled until it has been rightly settled. One may cry "Peace, Peace," but there is no peace, nor can there ever be any lasting world peace until this country, as a member of the family of nations, is willing to relinquish its present policy of selfish aloofness and to accept and perform its unavoidable responsibility in a world-wide rehabilitation. We, as medical men, gathered here to do honor to our sainted dead; we who, both from the nature of our duties and from the very reason of our being here, know the meaning of war in terms of human suffering, of anguish of mind and of body, of loss of life and limb—it is for us soldiers past and present to raise our hearts and voices in support of those principles as embodied in the League of Nations, or an international agreement, call it by whatsoever name you will, that has for its object the abolition of this damnable thing that we call "war," that makes for the settlement of international disputes by more humane and less barbarous methods than brute force, with all of its attendant evils.

The continuous development of the airplane and explosive bomb and the discovery and use of still more destructive poisonous gases, will inevitably further revolutionize warfare and soon make it too horrible even for contemplation. Perhaps this very fact may outlaw it quicker than international leagues or agreements of any kind. Meanwhile, until some such international agreement has become an established fact, and so long as other nations continue warlike preparations, common prudence and the law of self-defense will compel us to do likewise, in order not to be taken unprepared.

I should be untrue to myself, to my convictions and to my understanding of the significance of this occasion; I should be false to the memory of our honored dead and their heroic example, if I failed to give utterance to the deep conviction within me, namely, that the real lesson of the war is bound up in the prevention of its recurrence. The world is sick, sick unto death. The only remedy that offers the slightest hope for its recovery is the application, in our international relations, of the principles of the Golden Rule. Skeptics may scoff as they will, and call it too idealistic and too altruistic for this materialistic age. But there is that fine balance of international justice so essential for the firm establishment of a mutual understanding and confidence in the family of nations. Without it, all is chaos and confusion. Until all the nations of the earth are willing to work together to this end, no satisfactory solution of these pressing problems need be hoped for. All other specious and spurious remedies proposed from time to time by false prophets and strange political theorists are but as "sounding brass and a tinkling cymbal." Surely statesmanship is not wholly dead. Provincialism is no fit substitute for patriotism. But in order that this may not happen, and our nation become a reproach and a byword among the nations of the earth, it is necessary that you and I should speak in no uncertain sound for those whose voices are forever stilled, and say for them the words that we are sure they would have us utter.

"Every cloud has its silver lining," and in addition to the deeds of valor and the devotion to duty upon the part of members of the Medical Corps that lined the black war clouds in 1917 and 1918 and added luster to the glorious history of our Army, our literature has been forever enriched by some of their writings during that fateful period. The outstanding literary gem of the war, so considered by many, was written by a medical officer, Col. John McCrae. I refer to that wonderfully beautiful little poem, "In Flanders Fields."

Dr. McCrae was a Canadian, to be sure, but he had lived long enough in this country as one of the resident physicians of Johns Hopkins Hospital to have endeared himself to all those who knew him, of whom the speaker is proud to have been one. May I be permitted to repeat it here, "lest we forget."

In Flanders Fields the poppies blow
Between the crosses, row on row,
That mark our place; and in the sky
The larks, still bravely singing, fly
Scarce heard amid the guns below.

We are the Dead. Short days ago
We lived, felt dawn, saw sunset glow,
Loved and were loved, and now we lie
In Flanders Fields.

Take up our quarrel with the foe;
To you from failing hands we throw
The torch; be yours to hold it high.
If ye break faith with us who die
We shall not sleep, though poppies grow
In Flanders Fields.

And this by the same author.

O guns, fall silent till the dead men hear
Above their heads, the legions pressing on.
(These fought their fight in time of bitter fear
And died, not knowing how the day had gone).

O, flashing muzzles, pause and let them see
The coming dawn that streaks the day afar:
Then let your mighty chorus witness be
To them, and Caesar, that we still make war.

Tell them, O guns, that we have heard their call,
That we have sworn, and will not turn aside,
That we will onward, till we win or fall,
That we will keep the faith for which they died.

Bid them be patient, and some day, anon,
They shall feel earth enwrapt in silence deep,
Shall greet, in wonderment, the quiet dawn,
And in content may turn them to their sleep.

Fellow Americans, former comrades in arms, these, our honored dead, have indeed from their failing hands passed on to us the torch. With their last breath they have bidden us hold it high. Shall this injunction fall upon deaf ears? Dare we break faith with them who have given their all? Shall their quiet slumber be disturbed by the

failure upon our part "to carry on" after they have fallen? May we not here and now pledge ourselves and our all to the larger service of humanity, feeling confident that in so doing we will best continue the work so nobly begun by them, and assured that in emulating their noble example we will, at the same time, be serving best our country.

Reception and Dance

In the evening Colonel Reynolds entertained at dinner for the Surgeon General of the Army, the representatives of the medical services of other countries, General Finney, Captains Bogert and Carpenter of the Medical Corps of the U. S. Navy, and the former and present officers of the Association. Later there was a large reception and dance in the post gymnasium, attended by the delegates to the meeting, the guests, the officers and ladies of Carlisle Barracks and many visitors from nearby cities.

FOURTH SESSION, OCTOBER 5, 8.20 A. M.

Demonstration of the Lines of Medical Aid

The greater part of the day was devoted to the demonstration of the lines of medical aid from the firing line back to and including the field hospital. This demonstration was in charge of Major Taylor E. Darby, M. C., U. S. Army, a graduate of the School of the Line as well as the Army Medical School and Professor of Military Art at the Medical Field Service School. The troops of the First Medical Regiment were used for demonstration and the other post troops for simulated wounded.

The general and first special situation, together with the necessary maps, had been issued to the officers on the evening before this exercise, and they were advised to plat the situation on their maps in order to save time in becoming oriented on the ground the next day.

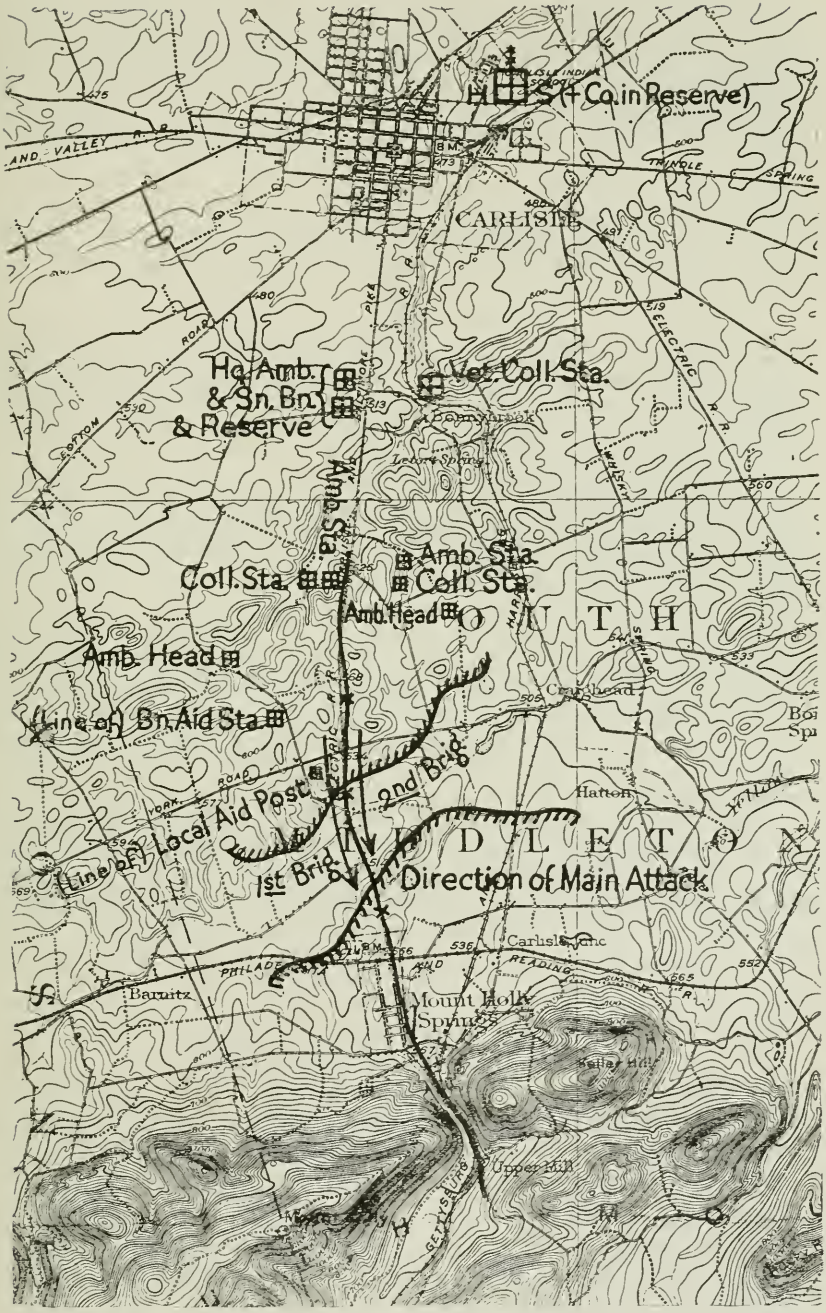
Maps: Carlisle Quadrangle Geological Survey 1:62500.

General Situation:

South Mountain forms the boundary line between 2 hostile states; Blue, North; and Red, South. Territory to the east is neutral. Red detachments are holding the frontier passes into Cumberland Valley. The Reds have completed their concentration. Blue concentration has been somewhat delayed. A Red Div. which concentrated in the Gettysburg area was reliably reported as moving north late on Oct. 4. Red organization is known to be similar in all respects to that of Blue The 1st Blue Div. was just completing its concentration in the Carlisle area. Reds declared war at midnight Oct. 4–5.

Special Situation (1st)

Early on Oct 5th a Red force debouched from the Mt. Holly Springs pass and by 11.00 A. M. had seized a bridgehead along the high ground south of Yellow Breeches Creek from the knoll 1 mile east of Barnitz, inclusive, to Hatten, exclusive. Their outposts are along the Creek. The force is estimated as about a Div.


H S (+ Co. in Reserve)
CARLISLE
Hq. Amb. & Sn. Bn. & Reserve
Vet. Coll. Sta.
Coll. Sta.
Amb. Sta.
Coll. Sta.
Amb. Head
Amb. Head
(Line of) Bn. Aid Sta.
(Line of) Local Aid Post
1st Brig.
2nd Brig.
Direction of Main Attack
Hatton
Carlisle Junc
Mount Holly Springs
Barnitz
Upper Hill
Valley Hill
Creighead
Boi
Spi

The 1st Blue Div. at daylight Oct 5th hurried infantry south in trucks. This force seized the high ground north of Yellow Breeches Creek, astride the Carlisle-Mt. Holly road and prevented the enemy from gaining a foothold. By noon the Div. was in position with Brigs abreast, 1st Brig. on the right, holding the high ground north of Yellow Breeches Creek from knoll ½ mile south of CR 577 to the knoll ½ mile west of Craighead.

The members and guests were conducted to a good observation point behind the first brigade zone of action by means of a civilian motor convoy and issued the second and last special situation.

Special Situation (2) (Blue)

Extracts from the 1st Div. F. O. issued at 10.00 A M verifies the previous information of the enemy and orders the Div. to attack at 1.00 P M, 5 Oct., penetrating the enemy center in the direction of CR 534—Upper Mill, driving his separated forces against South Mountain and destroying them in detail.

Line of departure: Present front lines.

Boundary between Brigs RJ 526 (to 2d Brig)-RJ 568-CR 534-RJ 514-CR 567 (all to 1st Brig). Each Brig. to attack on a 1,500 yds. front; the 1st Brigade to make its main effort on its left and the 2d Brig to make its main effort on its right; one bn from each brig to be in readiness at Letort Spring as Div. Reserve.

The 1st F. A. to support the 1st Brig and the 2d F. A. to support the 2d Brigade from positions 2-5000 yds back of the present line. The 1st Med. Regt. has been in camp at Carlisle Bks. on the night 4–5 Oct. The Div. Surg. had made a reconnoissance early on 5 Oct. to determine the probable location of units of the Med Regt. and routes of evacuation.

At the conference of the Div. Comdr. prior to the issuance of the F. O., the Div. Surg. learned of the plan of attack, and also that interior regts of each Brig would attack with 2 Bns in column, the 3d being sent to Div. Res. Exterior regts would attack with 2 Bns abreast, the 3d being in Brig. Res. After the G4 conference held soon thereafter, he submitted to G4 a plan of medical service for the 1st Blue Div. during the attack and had it approved.

Required

The F. O. of the 1st Med. Regt. to cover the attack.

At this point the entire military problem involved was discussed so that the medical problem would present itself and each officer have opportunity to make his own estimate of the medical situation.

From here the party was conducted to a point just behind one of the assault companies of the Second Infantry. The Blue forces at this time were holding defensively in an effort to restrict the enemy's bridgehead. Here the local aid post was demonstrated. It is formed by two men of the medical department as close behind the assault company as they can get and still have reasonable cover, such as a ditch, ravine

or other terrain, within 100 to 300 yards of the firing line. Here they dress and direct walking wounded back to the battalion aid station and collect recumbent wounded as opportunity presents during lulls in the firing, under cover of smoke or darkness, or at any time if cover presents. The equipment is what the two men carry on their persons, plus such extra supplies as the battalion surgeon sends forward by his litter-bearers from the battalion aid station.

The visitors were then conducted back to a battalion aid station, completely occupied and in operation, behind one of the assault battalions of the First Infantry. This was representative of the medical service behind all the front line battalions of the division. The battalion surgeon had divided his detachment into three parts, namely, one detachment of eight men (two men attached to each company) for the purpose of establishing the local aid post just demonstrated; one detachment of a noncommissioned officer and eight men used as litter-bearers to bring in the recumbent wounded of the local aid post of the battalion to the battalion aid station and to assist in dressing and directing the walking wounded to that point; and third, a detachment of seven men used as personnel to man the aid station proper. The complete equipment and operation of this station was then demonstrated in detail. The station is preferably used within one-quarter to one-half mile of the brigade front lines, on roads leading to the rear, with the necessary defilade to protect against aimed small-arms fire, centrally located with regard to the brigade front, on the natural line of drift of wounded and where wood and water may be readily obtained.

The members and guests were next conducted to an ambulance head established behind the First Brigade and in advance of the collecting station, covering the battalion aid posts of that brigade. It is usually practicable to establish such post in advance of the collecting station and it reduces the litter carry by that much. Instead then of carrying the recumbent by hand or wheel litter from the battalion aid stations to the collecting station, they are merely carried to the ambulance head, where they can receive ambulance transportation. It is often practicable to get ambulance heads right up to the aid stations, in which case we have an ideal method of evacuation.

By motor convoy the guests and members were now escorted to the collecting station covering the First Brigade. This station is established by one of the sanitary companies of the Sanitary Battalion. It is usually a mile or possibly 2 miles from the front lines, depending on the formation of the brigade and the terrain. The nearer it can be established within one mile of the front the better, for the litter carry from the battalion aid stations back is a strenuous matter. This site requires protection from aimed small-arms fire, which it obtains by

securing the necessary defilade. It also requires reasonable protection from artillery fire, which it may best secure by not establishing in a vicinity likely to attract artillery fire, such as the location of friendly artillery, brigade reserves or important cross roads. It requires a site sufficiently large to pitch two ward tents, establish its canteen section, and park its transportation. It requires wood and water, which, if not on the site, must at least be provided. Part of the personnel of this company establish a collecting station, while a part go forward as litter-bearers and establish connection with the brigade aid station, transporting back recumbent wounded by means of hand and wheel litters and directing walking wounded back to the collecting station. The collecting station proper is laid off into departments just as it is intended to evacuate.

The next formation which was demonstrated was that of the ambulance station covering the First Brigade. This station works hand in hand with the collecting station. It is preferably established as close to the collecting stations as is practicable so that service and communication may be as prompt as possible. If it is impracticable to establish in the immediate vicinity of a collection station, then they must at least have an ambulance head at that point so that its recumbent and sitting wounded may promptly be evacuated. At the ambulance station proper is found the ambulance company less those detached to form the ambulance heads, and the remaining transportation of the company. At this station they work the "shuttle system" so that all ambulance and personnel may do about the same amount of work. As each ambulance passes in going to the rear, the ambulance at the head of the line moves forward and takes its place, and as the ambulance which went to the rear returns from the hospital station it takes its place at the rear of the line. The same system is worked at the ambulance control post covering the ambulance heads in advance of the collecting station.

At this point and time dinner was served to the visiting members and guests from the rolling kitchen, and it was an interesting thing to see the Surgeon General of the Army, distinguished delegates and others line up as any company of soldiers would do, draw their rations in mess pans and sit down on the ground to eat.

After luncheon the field order of the medical regiment, which was the requirement in the problem, was issued to each member and discussed. It is interesting to know that the present field order of the medical regiment follows the same five-paragraph type of order that is used by the combat arms of the service. This type is so complete and perfect that there seems to be no reason for any branch of the service issuing its orders in any other form, and the Medical Department now conforms to that. The order is as follows:

AN APPROVED SOLUTION

1st Medical Regt.
Carlisle Bks, Pa.
5 Oct 23, 10.00 a. m.

Field Orders
No. 1.

Maps: Geological Survey 1:62500, Carlisle Quadrangle.

1. (*a*) A hostile division is occupying the high ground south of Yellow Breeches Creek from a point 1 mi east of Barnitz to Hatton.
   (*b*) Our Div attacks at 1.00 p m this date penetrating the enemy's center along the CR 534-Mt. Holly Spgs road.
   Line of departure: Present front lines.
   Each Brig attacks on a 1500 yd front, 1st Brig on right.
   Bound between Brigs: Carlisle-Mt. Holly Spgs Road.
   F A Regts in area from 2—5000 yds from present front lines.
2. This Regt will cover the medical service of the Division in the attack.
3. (*a*) The Sn Bn moving with the Amb Bn to the vicinity of RJ 513 will establish collecting stations at once as follows:
   One in vicinity of unimproved road junction 500 yds west of RJ 526 to cover 1st Brig.
   One in vicinity of draw 600 yds south east of RJ 526 to cover the 2d Brig.
   (*b*) The Amb Bn transporting the Sn Bn will move via the Carlisle 513 road to vicinity of RJ 513 and at once establish ambulance stations as follows:
   One in vicinity of the collecting station 1st Brig.
   One in vicinity of the collecting station 2d Brig.
   Transport active Sn Cos to collecting station sites. Establish ambulance head on unimproved road 1200 yds west of RJ 568 for 1st Brig and one on unimproved road 1500 yds north east of RJ 568 for 2d Brig.
   (*c*) The Hosp Bn will remain in its present location. Hosp Co No. 1 and No. 2 establish station by Noon. Hosp Co No. 3 remain in its present location in reserve.
   (*d*) Vet Co No 1 will move via CR 473–Bonnybrook road to vicinity of Bonnybrook and establish Veterinary Coll Sta at once. Cover collection from the Div.
4. (*a*) Service Co, Med Supply Sec and Med Lab Sec establish at Hosp Sta.
   (*b*) Amb routes: 1st Brig: Motors, via Carlisle and Balto Pike. Animal drawn, via all other roads.
   (*c*) All cases to Hosp Sta.
   Evacuation by Army.
5. C. Ps: Div. Surg and 1st Med Regt: Carlisle Bks.
   Sn Bn and Amb Bn : House at RJ 513
   Hosp Bn : Carlisle Bks.

COL. A.,
Commanding.

From the ambulance station the members and guests were returned to the vicinity of Carlisle Barracks by motor convoy, where the hospital station covering the division had been established.

Captain Thomas G. Tousey, M.C., in demonstrating the complete equipment used in the operation of a division hospital, addressed the meeting as follows:

The Hospital Station is located from four to six miles from the front line and its location is selected for its convenience to evacuation routes from the Collecting Stations; for its accessibility to ambulances from the rear areas; with due regard for location of danger points as cross roads, ammunition dumps, battery positions, etc., and its general suitability for Hospital purposes. The element of visibility need not enter into the selection of the site as the area occupied by the station is much too large to enable it to be made invisible to air observation and the placing of a large red cross on the ground should be sufficient notice to the enemy as to the nature of the organization.

Upon being ordered to establish a station the company, in its own transportation, proceeds to the vicinity indicated and the commanding officer thereof selects the actual ground to be occupied. The field selected must not only conform the above mentioned strategical requirements but wherever possible, effort should be made to pitch on (*a*) a gradually sloping surface, (*b*) a soil suitable for receiving and holding the pins, (*c*) a field large enough to allow expansion to the extent required by the complete station and (*d*) it should be in proximity to a good water supply.

The order to establish a station should contain an estimate of the situation. The amount of tentage erected at the initial establishment of the station should depend on this estimate. A hospital station of the entire twenty tents would not be indicated if but a local engagement were to take place. In this connection it must always be borne in mind that patients are not retained in the Hospital Station but for the minimum time required to make it safe for them to be transported to the Evacuation Hospital or to the Mobile Surgical Hospital. Therefore with such a resulting flow of patients, a bed capacity of, say two hundred, will be sufficient, often to care for many times that number of casualties within a twenty-four hour period.

If, therefore, the orders give an estimate of the situation, the adequate number of tents will be pitched to care for the contemplated casualties. In any event, certain departments of the hospital will be required and these departments of the station are

grouped into what is known as the Basic Unit. This Basic Unit is always erected when a station is established and will care for a considerable flow of patients or the retention of a small number. Then as necessity arises expansion takes place upon this unit and can go on until the entire equipment is set up.

When the company arrives at station, the first duty to be performed is the laying out of the field and this is done by the commanding officer or an officer designated to do this. He considers the matter of ingress and egress and remembers that expansion of the station may be called for. Using some form of marker (e.g., surveyor's distance markers) he paces off the area and places a marker at the point for the right, front corner of each tent space. He also indicates by markers where he wishes the right of the motor truck park to be and likewise the company street, the kitchen, latrines, etc. In each case, for the sake of uniformity, the point indicated should be the right, front corner of the area designated.

In laying off the area for the Basic Unit the following system is used (see fig. 1). First placing a marker (A) where the right of the truck line is to be, pace across the area twelve paces and place marker (B) which is for the right, front corner of the first shelter tent of the company street. Then pacing on for seven paces more place marker (C) which is used as a sighting marker only, in the Basic Unit, but which would be the right, front corner of a ward tent in the larger unit. Then pace on thirteen paces and place marker (1) which is the right, front corner of the admission tent. Again go on for thirteen paces and locate marker (D) in line with those already placed, this also marking a tent which is only erected in the larger station, the marker being placed here for use as a sighting marker in erecting the other tents. Thirteen paces farther on in the same line marker (E) is placed which is the right, front corner of the Commanding Officer's tent. From Point (E) and at right angles to the line of markers already placed, pace toward the rear thirty paces and place marker (2) locating the Supply Tent. Then on a line parallel to the original line of markers pace off succeeding distances of thirteen paces locating in turn markers (3), (4) and (5). Going back to marker (4) pace off to the rear thirty paces and place marker (6) in line with (1) and (4). The kitchen marker (F) is located thirty paces to the rear of point (2) and in line with (2)-(E).

When expansion of the unit takes place, ward tents are erected on points (C) and (D) and on points thirty paces to the rear of

points (3), (6) and (5); care being taken that the lines of tents are accurate. When the space available for the station is restricted the lateral distance between markers may be eleven paces and the distance in depth twenty-five paces. These distances will permit easy passage between the tents for litter squads and individuals, but prohibits the passage of vehicles.

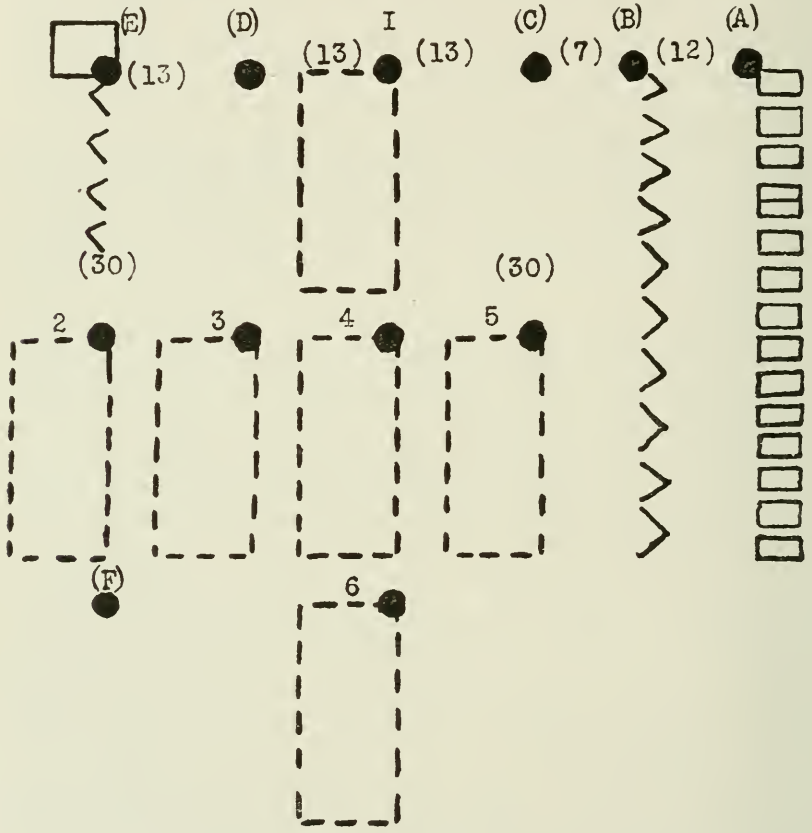


Fig. 1.—Points indicated by numbers represent the right front corners of the tents to be erected in the Basic Units.

As soon as the area is laid out the truck train comes onto the field, the company is dismounted and formed into tent pitching squads and the tents are erected. The equipment is then installed and conditions made ready for the reception of patients.

The commanding officer, as soon as his station is established, must notify the regimental commander of the fact giving the hour

of establishment and he should also, by diagram, give the exact location of the field selected. By another messenger, contact should be made with the Message Center at the Collection station, notifying it of the location of the Hospital Station and giving such other information as is thought necessary such as the best route of approach to the station, condition of the roads, etc. It is also well to place very conspicuous signs at the roads of entrance to the station indicating the name and number of the station; this to aid ambulance drivers and others seeking its location.

The Basic Unit of the Hospital Station contains, as was indicated above, the essential departments of the entire station and is so set up that with a very minimum of adjustment the larger station can be established upon it. It will be seen that the departments included within the Basic Unit are Receiving, Surgical, Shock Treatment, Bathing, Evacuation, Dental, Kitchen, Office and ward space. In expanding this unit then, the only change taking place is the increase in bed capacity by the addition of ward tents with their equipment. The Laboratory chest and the Dental Laboratory chests are also opened and set up in special tents. The accompanying diagram, not drawn to scale, shows the arrangement of the Hospital Station, the part included within the dotted line representing the Basic Unit (see Fig. II).

Inasmuch as the Hospital Station is a very expansile unit and may be called upon to function in one or all of several different ways the personnel of the Hospital Company must be a highly trained one and the organization of the company, to say the least, must be most flexible. The personnel must be so assigned that a rapid shifting of a detail from one duty to another will disturb the general functioning of the organization to the least possible extent. The Basic Unit personnel, so long as the function of the station remains general, will always remain about the same and the assigned individuals will function in their several designated places regardless of the size of the station. As ward tents are added, however, the chief demands are for additional ward attendants and nurses and litter bearers. The truck drivers of course can supply a great deal of this demand and others can be furnished by reducing the size of some of the other details. If the function of the station is to be purely medical, as in the case of the company being ordered to care for the divisional sick, then the nursing and messing departments become more important and some of the Basic Unit personnel are temporarily taken into the nursing section of the company.

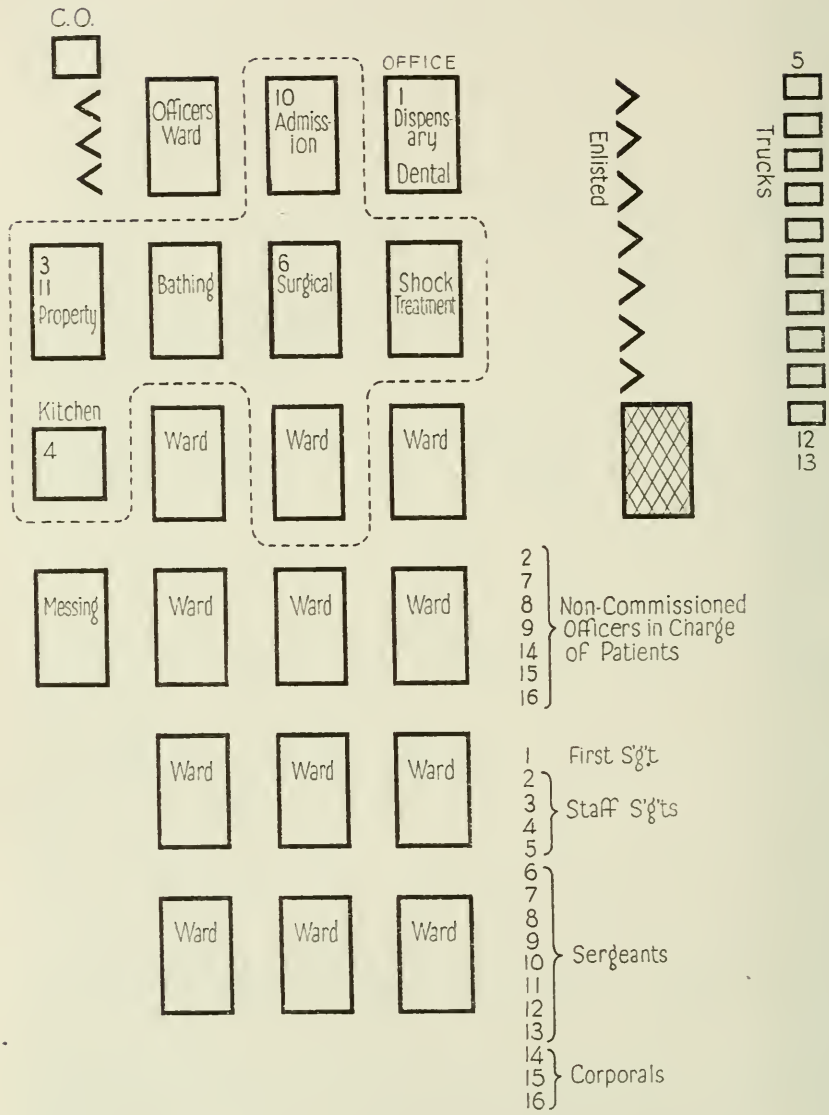


FIG. II.—The placing of the personnel within the station will vary under certain conditions but, in the large station it may be disposed of as in Fig. 3.

The distribution of the personnel of the Hospital Company and the various departments to which shifts may be made may be diagrammed as in Fig. III. It is not supposed that this scheme covers every possible contingency but it permits a grouping of the personnel into sections with definite primary duties and it also indicates to the one in charge of personnel, the department most ready to supply additional help when the need arises.

It will be seen that there are two distinct lines of administration required in the Hospital Company; one being such company administration as is common to all company organizations and the other having to do with records of patients. The latter consists of such records and reports as are required at a Hospital Station concerning the patients and professional activities. It is not contemplated that patients will be retained here for any length of time. One hour or up to twenty-four hours possibly. At least the patient is not going to be hospitalized here for definitive treatment. So no hospital records are made other than a recording of the patients by name, serial number, rank, organization, diagnosis, date and hour of admission and date and hour of disposal. The point to which the patient is evacuated is also noted. (See sample sheet, Fig. IV of Hospital Log.) The entire record is made out in the receiving tent with the exception of the disposition. The data is all taken from the Emergency Medical Tag on the patient. At the time of disposition a record is made of the event in the Evacuation Tent and later this record is sent to the Hospital Office where the disposition of each patient is noted on the Hospital Log and the retained copy of the log constitutes the only record of the patients passing through. Of course, as in all other stations, there are certain treatments given here and a record is made of the fact on the back of the Emergency Medical Tag but no retained record of such event is kept. At regularly stated intervals copies of this record of patients are sent to the Division Surgeon and also to the Hospitals to which the casualties have been evacuated.

The transportation of the Hospital Company consists of one Dodge touring car, twenty Garford trucks (1½ tons capacity each), 2 motorcycles, 1 rolling kitchen and 1 trailer tank. The distribution of the property on these trucks is a very important matter and has been worked out so that a certain group of trucks will carry the property for a certain department of the Station. As has been said already, the Basic Unit will always be erected when the Company is ordered to station and so the property pertaining to

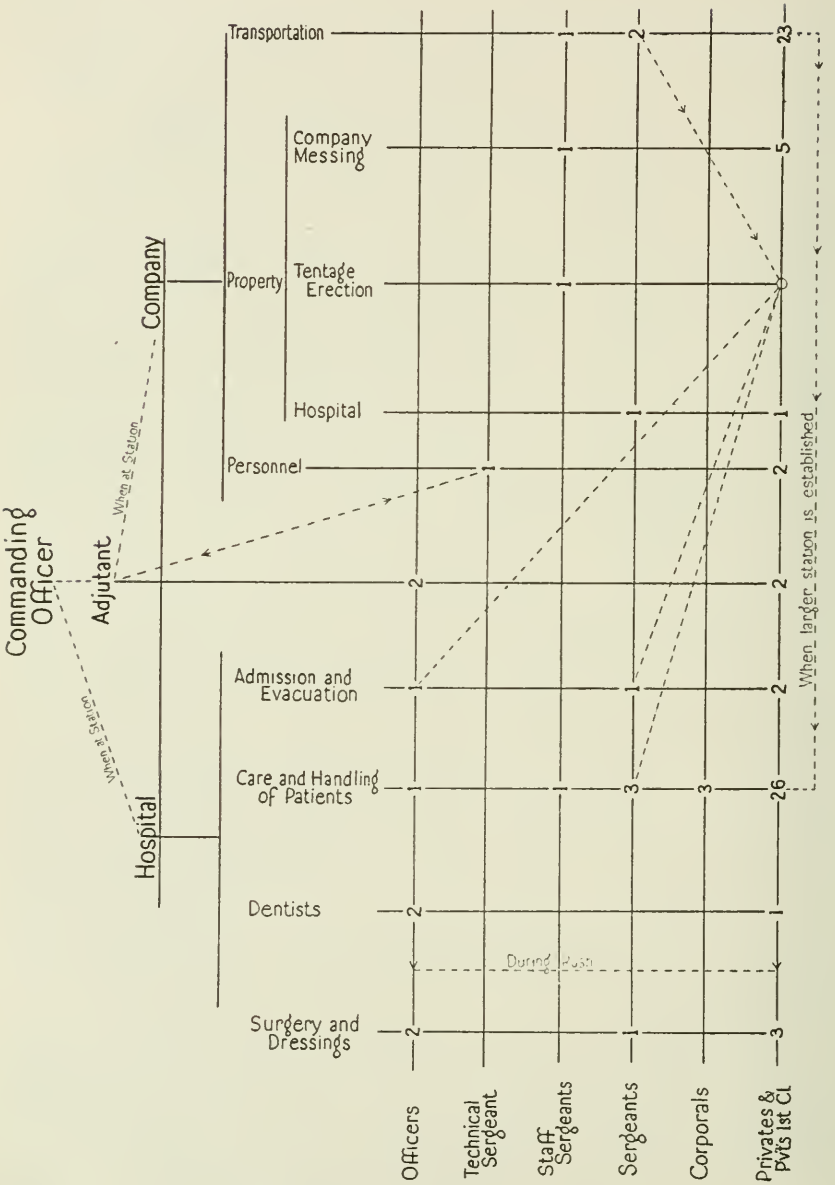

Commanding Officer
Adjutant
When at Station
Company
Property
Transportation
Company Messing
Tentage Erection
Hospital
Personnel
When at Station
Hospital
Admission and Evacuation
Care and Handling of Patients
Dentists
During Epidemic
Surgery and Dressings
When larger station is established
Officers
Technical Sergeant
Staff Sergeants
Sergeants
Corporals
Privates & Pvts 1st Cl
23
5
1
1
2
2
2
26
1
3

FIG. III.

this unit is carried on certain of the trucks. This group of trucks is known as the Basic Unit section and moves at the head of the train whenever a convoy is formed. After the Basic Unit section, the trucks have been arranged in pairs so that one of the two trucks carries the tentage for three wards and its mate carries the ward equipment for the same three tents. Thus when expansion takes place there are three tents erected at a time and the property is installed within them, three wards constituting a section of wards. There is one non-commissioned officer placed in charge of each section of wards and if expansion is called for this non-commissioned officer is notified and he in turn calls for the trucks carrying his section, procures a detail for the erection of the tentage and establishes his ward group. His personnel is a certain group of men and so the fact that there are three more wards to care for need not disturb those departments already functioning. Other trucks carry surplus medical supplies, gasoline, fuel, etc.

As to the actual working of the different departments a description of the working of the Basic Unit reveals the working of the entire station.

Fig. IV

GSW Gunshot Wound
BW Bayonet Wound
SK Sick
GA Gassed (M) Mustard, (P) Phosgene
Sl Slight
S Severe

Organization
Location
Date

Admitted from
Evacuated to
Died
Remaining in Station

Admitting Officer

Name	A.S.N.	Rank and Organization	Diagnosis	Hour	Disposition

The patients are received from the ambulances at the front of the admission tent. Here is found an unloading squad of four men whose duty is to remain in that vicinity for the purpose of unloading ambulances. In this same location is also found a representative of the property section who tends to the exchange of litters, splints, blankets, etc., between the hospital and the ambulances bringing in patients. For every such article that comes in with a patient, he places back into the ambulance, before it

returns to the front, similar articles and in like quantity as was taken from the ambulance with the load of patients. In this manner there is an absolute replenishing of the front with the articles taken from that point by the evacuation of patients. The unloading squad carries the patient into the admission tent and then returns to its post. The officer in charge of the admission of patients makes an examination of the patient and sends him to the department of the hospital caring for the type of injury of each particular patient. It is usually to one of the second row of tents to which the patient is taken as it is in this row that the tents, devoted to the professional care of patients, are located. It is not the purpose to give real definitive treatment here, but the dressings put on at the forward stations are thoroughly investigated and changed as necessary, splints are adjusted, bleeding controlled, etc., in short, conditions are made such that it will be safe to transport the patients to the Evacuation Hospital or to the Mobile Surgical Hospital for more extensive treatment and where definitive treatment will be started. For the early treatment of Surgical Shock a special tent is arranged next to the surgical tent and here such measures as application of heat, stimulation, feeding where possible, control of pain, etc., will take place. On the side of the surgical tent opposite to the shock treatment tent is a tent for the bathing of patients. It is here that they may be prepared for the surgical tent by removal of uniforms and placing in pajamas. They are here bathed, shaved and made generally more cleanly than when they were admitted. Behind the row of treatment tents all the tents are devoted to the housing of patients and in these wards they are fed and cared for until such time as they are pronounced fit for evacuation by the Evacuating Officer. At that time they are carried to the tent designated as the Evacuation Tent where a record is made of the name and the hour and the hospital to which he was evacuated and this record is sent to the hospital office.

The Dental department and the Laboratory department of the hospital station are established in the tent erected to the right of the admission tent, but these departments are not operated fully, except when the larger station is established.

Chemical Warfare Demonstration

This demonstration was given later in the afternoon of October 5, at Farm No. 2, which is a part of the military reservation. Here the Chemical Warfare Service troops from Edgewood Arsenal carried out

an actual demonstration of chemical warfare. This was very successful and served to make more vivid the handling of simulated gas casualties of which we had had a number pass through our different echelons medical assistants. A special discussion had also been held at the battalion aid station, the collecting station and the hospital station on the handling of gas cases. The Chemical Warfare Service's program was as follows:

PROGRAM OF CHEMICAL WARFARE DEMONSTRATION

1. *Rifle Grenades, White Phosphorus Filling.*—These grenades were used to put down smoke screens from a short distance and also for attacks on machine-gun positions. The phosphorus besides being of value for setting up smoke also has a very pronounced incendiary action.

2. *Rifle Grenades, Tear Gas Filling.*—The grenade is of the non-fragmenting type. It can be used against mobs with no danger from flying fragments. The gas has no permanent effect unless the patient is exposed to a strong concentration for an extended period of time.

3. *Tear Gas Candles.*

4. *Smoke Candles.*—These are used for screening purposes.

5. *Mortar Demonstration.*—The base of the shell has a cartridge container which holds a paper cartridge built along the same lines as a shot-gun shell. Around the cartridge container are placed silk rings containing smokeless powder, the number of rings varying according to the range desired. The shell being dropped down the barrel, a firing pin at the base of the mortar strikes the primer of the cartridge held in the cartridge container. The flash from the cartridge is communicated to the rings, and the force of explosion throws the shell from the mortar, arming the fuse. The fuse is so constructed as to explode the shell, regardless of how the shell strikes the ground. In action, such precautions as using a sandbag emplacement or firing with a lanyard would be dispensed with. The extreme range of this mortar is 1,050 yards.

(*a*) Tear gas shoot.

(*b*) White phosphorus shoot.

This demonstration was in charge of 2nd Lieut. Edward J. Sullivan, C.W.S., and enlisted men from the Edgewood Arsenal who had been ordered to Carlisle for this purpose through the courtesy of the chief of the Chemical Warfare Service.

From 4 to 6 p. m. on this date the ladies of the post of Carlisle Barracks entertained the visiting officers and their ladies at tea. At 8.30 p. m. an informal smoker was held in the post gymnasium, at which time there were boxing bouts and wrestling between soldiers and semi-professionals and ending with a battle royal between four colored men. This was an extremely enjoyable affair and will long be remembered by those who had the pleasure of being present.

FIFTH SESSION, 9.30 A. M., OCTOBER 6

THE PRESIDENT: While I know this subject will be covered in special resolution, I do not think, as president of the Association, I ought to let the occasion pass without a very special word of thanks to Colonel Reynolds and the staff of this school. In my preliminary remarks I stated that the arrangements which they had in contemplation were excellent, and certainly the reality makes what I said on that occasion very feeble. I am sure that we are all agreed that nothing that could be done has been neglected, and I am very sure, too, that the standard which has been set through their efforts is a higher one than we have ever before attained and that their work on the occasion of this meeting is going to bear fruit for many, many years.

REPORT OF THE AUDITING COMMITTEE

The Auditing Committee, Colonel Ford, Chairman, announced that the committee had examined the accounts of the Association and found them to be correct. A motion by Dr. Marsh, duly seconded, that the report be accepted, was carried.

REPORT OF THE COMMITTEE ON RESOLUTIONS

The Resolutions Committee report the following resolutions. *Be it resolved:*

1. That the Literary Committee, as provided for in Section 4 of the Constitution and By-laws, be composed of one member each from the following branches: The Army Medical Corps, the Army Medical Reserve Corps, the Naval Medical Corps, the Naval Medical Reserve Corps, the U. S. Public Health Service, the U. S. P. H. S. Reserve Corps, and the National Guard.
2. That the Surgeons General of the Army, Navy and Public Health Service be urged to use their influence to have the officers of their respective corps affiliate with The Association of Military Surgeons.
3. That a membership committee consisting of one member from each corps area or state be appointed by the chair to stimulate membership of National Guard in the Association.
4. That the word "militia," where it appears in the constitution and by-laws, be changed to read "National Guard."
5. That a vote of thanks to Col. Chas. R. Reynolds, the officers and the ladies of the post be tendered by the Association for their part in the success of the meeting, and for the many courtesies extended to the individual members.
6. That we extend our sincerest appreciation to the delegates of the foreign countries who have honored us by their presence at this meeting.
7. That a vote of thanks be extended to Brig. Gen. Amos Fries, C.W.S., for the splendid Chemical Warfare Demonstration presented to the Association.
8. That a vote of thanks be extended through military channels to

2nd Lieut. E. J. Sullivan and his enlisted personnel who by the Chemical Warfare Demonstration provided a most practical lesson to all the military surgeons in attendance.

J. D. Griffith,
William S. Conkling,
James F. Coupal.

A motion by Colonel Seaman that the resolution involving a change in the constitution take the usual course was seconded and carried. A motion to adopt the other resolutions was seconded and carried.

Brig. General J. D. Griffith, M. C., Missouri N. G., Ret., presented the following resolution:

Resolved, that The Association of Military Surgeons in session at Carlisle, Pa., recognizing the provisions of the Washington Peace Conference, especially concerning poisonous gases or chemical warfare; but—

Whereas, it is a fact that the great majority of the nations of the world have not ratified this treaty, and whereas preparations to meet and protect ourselves against gases or chemicals of any nature is a measure of national safety; be it

Resolved, by this Association, that the military surgeons of this country should be thoroughly prepared to handle and properly treat casualties produced by this method of warfare. Be it further

Resolved, that a copy of this resolution be forwarded to the Secretary of War, Secretary of the Navy and members of the Military and Naval Committees of the United States.

It was moved and seconded that this resolution be adopted, and it was so ordered.

The Special Committee on Resolutions presented the following:

Whereas, death has removed from among us the beloved and respected Secretary-Treasurer of this Association and Editor of The Military Surgeon, Colonel James Robb Church.

The death of Colonel Church has taken from the field of medico-military affairs a conspicuously devoted and able colleague. His services to the Association of Military Surgeons of the United States have been invaluable. Therefore be it

Resolved, that this Association, in annual meeting assembled, attest our great appreciation of the lovable personal qualities and high professional attainment of Colonel Church, and tender to his family our deep sympathy in their great loss.

Merritte W. Ireland,
Gilbert E. Seaman,
Charles R. Reynolds,
Committee.

General Griffith moved the adoption of this resolution, asking for a rising vote. The motion was duly seconded and a rising vote carried.

Major McKinney presented the following resolution signed by Colonel Amerson of the Illinois N. G.:

In view of the fact that no provision is now made for vocational training of Federalized National Guard Casuals or such of the regular service of recent enlistment; be it

Resolved, that the Association of Military Surgeons make such recommendations or take such action as necessary to extend the scope of the Sweet Bill to include casuals of the Federalized National Guard and the regular service not now included.

General Griffith, in seconding this resolution, asked that it be referred to the Executive Council with the understanding to report at the next meeting. The motion was carried.

The Nominating Committee presented the following list of nominations:

For President, Col. Gilbert E. Seaman, M. C., Wisconsin N. G.; First Vice-President, Surgeon General Hugh S. Cumming, U. S. P. H. S.; Second Vice-President, Rear Admiral E. R. Stitt, Surgeon General, U. S. Navy; Third Vice-President, Maj. Gen. M. W. Ireland, Surgeon General, U. S. Army; Secretary-Treasurer Major Edgar Erskine Hume, M. C., U. S. Army; and Col. Jefferson R. Kean, M. C., U. S. Army. This arrangement was made necessary by the fact that the Surgeon General of the Army found it impracticable at the present time to detail an officer on the active list of the Army to serve as Secretary-Treasurer of the Association and the representatives of the Navy and Public Health Service stated that they had no names to suggest for the office of Secretary-Treasurer. At the same time no retired officer would be available until the retirement from the Army next year of Col. Jefferson R. Kean, M. C., U. S. Army. It was therefore recommended that Major Hume serve as Secretary-Treasurer until the retirement from active service of Colonel Kean after which time Colonel Kean will assume the duties of that office.

A motion by Major Coupal, seconded by General Griffith, that the secretary cast the unanimous ballot for the nominees, was carried.

The newly elected president, Col. Gilbert E. Seaman, was then escorted to the chair by General Griffith and Colonel Keefer.

Upon assuming the chair, Colonel Seaman spoke as follows:

Mr. President, and Gentlemen, I shall not detain you with any speech except to say that I am fully appreciative of the very high honor conferred upon me in choosing me as your president. It is indeed a subject of appreciation on my part. This Association was organized in my home city under the leadership of our then state surgeon, the Surgeon General of the Wisconsin National Guard, Colonel Senn. I have been enlisted in the Association since its origin and have been more or less an active member for many years. I fully recognize the importance to military medical matters of the work of this Association. I hope that I shall be able to conduct the affairs of the president in a manner that

at least may not be unworthy, guided as I shall be by the very many distinguished and able leaders that we have had in the past.

The secretary read a letter from Col. Gustavus M. Blech, M.O.R.C., U.S.A., expressing his regret at being unable to be present at the meeting.

Lieut. Colonel Anderson, R.A.M.C., addressed the meeting as follows:

Mr. President, I ask the indulgence of the meeting for a moment to express the appreciation of Colonel Cameron and myself. I offer you, sir, our thanks, firstly, for the honor conferred upon us in electing us members of this Association and also our appreciation of the work which has been done, the instructive matters which have been demonstrated to us during this meeting, and I would ask you, sir, to convey to the Chairman of the Committee on entertainment and the ladies of this Post our sincere thanks for the hospitality and delightful entertainment they have provided for us. It is not empty form of words when I say we tender to you as President of this Association our great thanks and great appreciation for all that has been done for us here. We shall carry away with us and shall ever bear in mind the most pleasant memories of the Medical Field Service School and the Thirty-first Annual Meeting of The Association of Military Surgeons.

The representatives of the other foreign services also expressed their thanks to the Association for their election to membership, and for the hospitality of the Commandant of the Medical Field Service School.

A motion by Colonel Comfort that the Executive Council understand the sense of this meeting to be that the future meetings of the Association will be held at the service schools or some similar place, along the lines of this meeting, was seconded by Major Coupal and carried.

Dr. Brown of Milwaukee: I desire to offer a motion that, I am sure, expresses the feeling of us all. I feel that we ought to go on record, expressing to our presiding officer, Colonel Lynch, what he already knows by what has been said, that we desire to place on record our sincere appreciation of what he has done this last year.

This motion was seconded by Dr. Marsh and carried, a rising vote being requested.

On motion of General Griffith, the meeting adjourned *sine die*.

VISIT TO THE BATTLEFIELD OF GETTYSBURG

The afternoon of the last day was devoted to a visit to Gettysburg. The entire party went over the battlefield and Major M. C. Stayer explained the general military situation, particularly the activities of the medical departments of the Union and Confederate Armies in that decisive struggle.

GENERAL ORGANIZATION OF THE TREATMENT AND EVACUATION OF WOUNDED WITH FRACTURES, IN THE AREA OF THE FRONT[1]

By Médicin Principal de 1ére Classe MARIE LOUIS FIRMIN DUGUET

Professeur a l'Ecole d'Application du Service de Santé, l'Armée française

FIRST of all I desire to thank the president of The Association for having done me a great favor in permitting me to speak to you today. It is an honor of which I am profoundly sensible.

I desire to speak to you concerning organization for the treatment of fractures of the extremities in armies in the field. The choice of this subject has been made for two reasons: First, as a tribute to our comrades in the American Army, Blake, Keller, Hodgen, Smith, and many others who brought to us in the course of the late war the precious assistance of their experience from the point of view of the immobilization and the treatment of the fractures of the extremities. I can never forget a great-hearted woman, Miss Gassette, who founded in Paris, at the beginning of the war, the Franco-American Committee for Functional Disability, bringing to our wounded the aid of her devotion and her experience.

The second reason which guided me is that in a practical school of the medical service there is no subject which seems to me to be more properly considered, since it involves the question of apparatus, means of transportation and the organization of sanitary formations.

ORGANIZATION OF THE TREATMENT OF FRACTURES OF THE EXTREMITIES IN ARMIES IN CAMPAIGN

War fractures, by reason of their frequence, their gravity, the difficulty of treatment, both operative and postoperative, and their significance from the functional point of view, justify a trué surgical specialization and necessitate, in armies, a technical organization for their special care.

Statistical Data.—Their number is high—7.63 per cent of the total number of wounds observed. They involve frequent surgical intervention—14 to 17 per cent of the major operations carried out in armies, according to statistics which Medical Inspector General Toubert presented to the Inter-Allied Surgical Congress at its seventh session in 1920. This means that they probably absorb an important part of

[1]This paper was read in French before the 31st Annual Meeting of The Association of Military Surgeons of the United States at Carlisle Barracks, Penna., October 4 to 6, 1923. Translation by the editor.

the hospitalization resources of an army, and this fact must be considered in planning for hospitalization.

Their Gravity.—From the point of view of the conservation of the extremities and from the point of view of mortality this is well known. If we again quote the statistics of M. Toubert (above cited) we find that bone is hit in:

52 per cent of the wounds of the arm,
80 per cent of the wounds of the forearm,
28 per cent of the wounds of the thigh,
55 per cent of the wounds of the calf,

forming therefore an average of 53.75 per cent of the wounds of the extremities.

If, by reason of the anatomical structure, the frequence of fractures of the lower extremities is less than the number of those of the upper extremity, their gravity is so much the more accentuated (concomitant lesions of the great vessels and gas gangrene). The proof of this is found in the fact that the general proportion of amputations is 30 per cent in the upper extremities as contrasted with 70 per cent in the lower extremities, because these lesions of the bone are those most often complicated by acute septic conditions resulting in the loss of the limb.

To this gravity, from the point of view of the conservation of the limb, there is added, from the point of view of mortality, a special danger in the case of fractures of the thigh. In a special communication which we have had on this subject with our friend Lardennois, we arrived at the conclusion that about 50 per cent of fractures of the thigh may end in death either on the battlefield (hemorrhage and shock) or in the hospital. This estimation is perhaps pessimistic, yet it takes into account the extreme gravity of such lesions and leads to the conclusion that they demand *special care on the battlefield.*

Fractures of the lower extremities are, therefore, most grave, and they are also the most difficult to immobilize (to reduce).

Evolution.—We must recognize in the clinical history of war fractures, four stages or four successive phases:

A. Preoperative stage or the stage of early immobilization and first transportation.

B. Operative stage.

C. Postoperative or the stage of orthopedic and functional consolidation.

D. Sequelae or physiotherapy.

A. The preoperative stage corresponds to the *period of immediate immobilization and first transportation.* It is of considerable importance.

A patient with a fracture suffers. He must be perfectly immobilized. He is, moreover, exposed to grave infection. He must be rapidly transported to the hospital in order to be operated upon.

The best apparatus for primary immobilization should be carefully applied on the battlefield itself, if circumstances permit. The French Service de Santé has long since condemned the various improvizations such as the bayonet, saber, gun, blankets, branches of trees, straps, etc., improvizations which are only acceptable in case of complete emergency and absolute need.

With pleasure we mention here the happy results obtained by our American colleagues in the important matter of the early immobilization of fractures. The French Army is indebted to them, especially as regards primary immobilization of fractures of the lower extremities.

Fractures of the upper extremities are generally easy to immobilize at an early stage by means of simple bandages and splints of metal, cardboard or wood, and transport is possible very often in a sitting posture.

But it is, above all, the fractures of the lower extremities which constitute the problem of early immobilization and first transportation by reason of the difficulties of maintaining a steady posture and immobilization. For example, immobilization by means of the gutter splint does not suffice because it does not bring about any reduction, neither does it prevent the overriding nor the rotation of the lower segment of the limb. It is indispensable to bring about at once permanent extension and counter-extension. This is the principle made use of in the American apparatus.

The French Army has irrevocably condemned the use of simple rigid basket splints, whether of lattice or of metal. It has adopted four types of apparatus: the gutter splint of Jeanbrau, the Thomas splint as modified by Lardennois, the apparatus of Pouliquen, and a splint made of wood and known as the external splint. In all of these apparatuses the fundamental principles are well known to you. We show you here the apparatuses as well as the charts indicating their mode of use. This will obviate any long or complete description.[2]

The Thomas splint was perfected by a modification devised by Lardennois and which consists of adapting the upper ring to the contours of the perienum. It opens like a compass, thus enabling the splint to be slipped easily under the lower extremity like a basket. Its advantages consist in a greater facility of applying it and mitigation of the suffering of the patient.

---

[2]On behalf of the Service de Santé of the French Army, Col. Duguet presented the appliance to the Medical Field Service School.—Ed.

These four appliances are part of the regular equipment of the French Army in the field, excluding all others.

It is indispensable that the apparatus for immobilization *be applied as soon as possible after the wound is received.* A reexamination of their fit may be carried out at the place where the wounded are loaded into into the automobile ambulance or in the divisional dressing station. There the patients with fractures are placed together in the same vehicles and sent without intermediate stop and by the most rapid route to the hospital center designated in advance for their treatment.

B. Operative Stage.—Along these general lines the treatment of fractures follows the methods generally used for the treatment of war wounds but always considering the special methods of treatment of bone injuries: reduction, removal of chips, bone sutures, etc. There is an advantage in doing this early (although bone resists infection for quite a long time), thus giving the wounded man the benefit of healing by first intention.

This therapeutic measure requires an X-ray equipment in order to perform the extemporaneous verification at the bed of the patient. There is also needed a special apparatus for the control of fractures and a specialized personnel who know its application and understand its use.

Finally, it is necessary to provide a great supply of apparatus, and there is need of a workroom for its preparation and reparation annexed to the hospital wards.

For these several reasons, and if one takes account of the frequence of fractures and their gravity, it will be evident that we must consider as necessary the creation in each army of one or more *specialized services* grouping the competent technical personnel (surgeons, physicians, technicians, nurses and workmen) and material (workrooms).

These special operative services are either separated formations or elements of evacuation hospitals, the last being either primary or, preferably, secondary. They are situated on an average between 20 and 40 km. from the firing line.

C. Post-operative Stage.—As soon as infection is overcome and the osseous lesion treated, there begins the *orthopedic stage,* or the *stage of consolidation.*

Ideally as soon as operated upon, the wounded man would be placed in the apparatus, where the union would take place under the surveillance of the surgeon. This, however, is only possible during a period of calm and presupposes, moreover, great hospital resources which are rarely available. For example, at Verdun, between the first and thirtieth of March, 1916, 2,432 fractures were observed. It is evident that it would not have been possible to retain all of these wounded at

that place. As a matter of fact, all fractures do not present the same degree of gravity.

It is important to bear in mind from the clinical point of view *that the transportation of the wounded is incompatible with healing of the fractures.* The wounded man is sometimes transportable, at times for long distances (taking into account the initial gravity and his condition at the time), before intervention or in the first days following the operation. On the other hand, he must not be transported later than the onset of the bony union, that is to say, at the beginning of the second week (we are dealing chiefly with fractures of the femur).

As a matter of fact, fractures of the thigh do not stand a long journey well. There is considerable likelihood of general shock, and even with good immobilization apparatus they must be considered as unfit for transportation for great distances at the beginning of the period following their wound. It is necessary, therefore, to reserve considerable space for them in the special services. On the other hand, they must be evacuated in the first days following their operation, and for this purpose plaster casts should be applied or else the Thomas-Lardennois splint.

This last apparatus may, under certain circumstances, be used as the final or treatment apparatus. Ardouin de Rennes, made prisoner with multiple fractures of the femur, treated them and cured them satisfactorily by the application of the Thomas apparatus to which he had joined a plaster bandage in order to permit the apparatus to be extended on to the perineum without injuring the soft parts.

We believe, then, that the period of healing should be passed generally in a special sanitary formation distinct from the operative formation and situated in the zone of communication or of the interior from 80 to 100 km. from the front and provided with specialized personnel and necessary matériel.

Knowing the great number of fractures to be treated and the long duration of their hospitalization, it is important to consider that at each operative service at the front there should be several services of consolidation and of orthopaedics. These different services remain under the *technical authority directed by the chief of the operative services.*

D. Stage of Sequelae or of Physiotherapy.—This is the final stage, and will vary according to whether the wounded man is definitely disabled, justifying reconstruction, or is a convalescent who may recover after appropriate physiotherapeutic treatment. Heitz-Boyer advises the separation of these two categories in the different services.

Figure 1 shows the organization of the treatment of fractures. It is not merely a theoretical plan. Even in 1916 it had already been specialized in the French Army by Alguier, Fresson, Heitz-

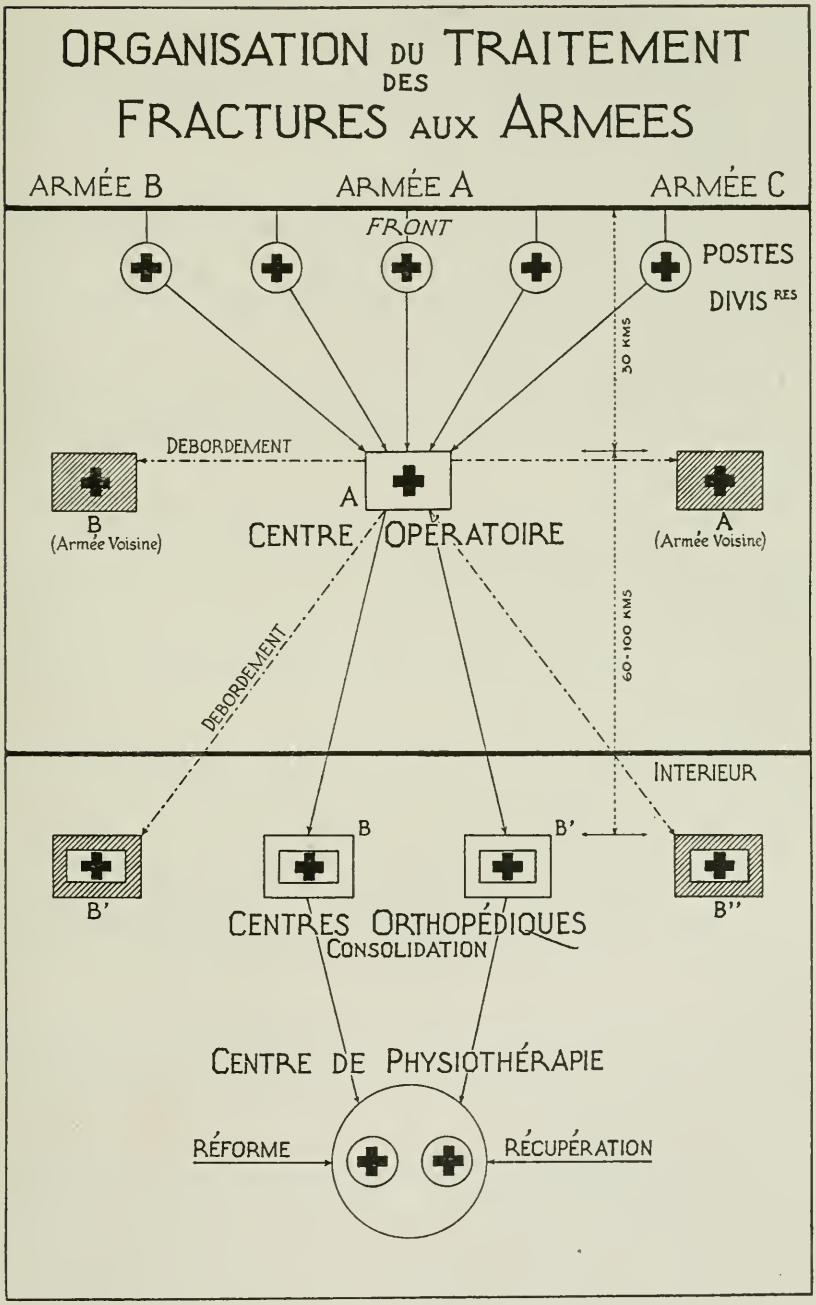

ORGANISATION DU TRAITEMENT DES FRACTURES AUX ARMEES
ARMÉE B
ARMÉE A
ARMÉE C
FRONT
POSTES DIVIS RES
30 KMS
DEBORDEMENT
B
(Armée Voisine)
A
CENTRE OPÉRATOIRE
A
(Armée Voisine)
DEBORDEMENT
60-100 KMS
INTERIEUR
B'
B
B'
B''
CENTRES ORTHOPÉDIQUES
CONSOLIDATION
CENTRE DE PHYSIOTHÉRAPIE
RÉFORME
RÉCUPÉRATION

FIG. 1.

Boyer, and Tanton. It was generalized at the beginning of 1917 according to the principle which we have studied above and completed, following consultations in writing and periodical meetings of the chiefs of the services. It has given most happy results. The figure shows the principle point of these surgical bone groups (Heitz-Boyer) and their branches.

The principal character of our organization *which must be preserved in time of peace with all its personnel and matériel* was to conserve under the same technical direction the different stages passed through by the men after being wounded up to the point of bony union, thus permitting the standardization of therapeutic methods and apparatus, the exchange of personnel and of matériel, etc.

Certain chiefs of the fracture services go even up to the first-aid stations and supervise the application of the first immobilization apparatus and the transportation, demonstrating the proper procedures to the regimental surgeons.

Comments.—Is the organization valuable under all circumstances? Theoretically, yes, if there is at least one surgical group for bone injuries per army and if each operative center is united with at least two orthopedic centers. But war is pregnant with surprises. Practically, then, it is necessary to anticipate, in carrying this out, a certain flexibility, capable of responding to the needs, whether they be unforeseen or uncommon.

At this point it is necessary to consider that, in the periods of intensive military activity, the various bone groups of the entire army may render mutual assistance. Such support occurs under two circumstances, that is, before and after the operative phase.

Before the Operative Phase.—That is whether the rapid transfer of nonoperated wounded to operating centers or the nearby groups or, on the other hand, the bringing forward of available surgical equipment provided for these groups and reinforcing the overworked operating centers.

After the Operative Phase.—This is the evacuation of the operated wounded to the orthopedic centers of neighboring armies (the greatest restriction always being placed on the transportation of patients with fractures of the thigh).

Finally, it is necessary to consider that if the treatment of fractures is to be advantageously specialized as we have shown, it will constitute a liability in periods of great activity and on account of the great injury to the wounded. To this last point of view, it is necessary indeed to admit that, considered in certain delicate conditions (high and low fractures of the femur, for example), every qualified surgeon should be

in a position to correctly treat fractures. The general surgical services of the front formations should therefore be able to receive and treat fractures of the extremities. But here the question of the supply of apparatus arises. It would be easily solved by creating a special personnel for apparatus (*appareilleurs*), who, trained in the surgical fracture centers (being centers of instruction such as those which were formed in the French Army), could in the case of great activity take over half of the work of the operators either as regards treatment or evacuation. Under these conditions, it is necessary, then, to provide in each evacuation hospital (h. o. e.), and above all in each secondary evacuation hospital (h. o. e.), independent bone groups already existing, and personnel ready to assure any existing cases treatment of simple fractures, grave fractures (those of the thigh in particular) already existing, and those of the divisional post, directed by as complete charges as possible, on the principal operative center of the group for bone injuries.

ORGANIZATION OF THE FRENCH MEDICAL SERVICE DURING THE OPERATIONS OF AUGUST, 1917, AT VERDUN: HISTORICAL ACCOUNT

LE MEDECIN PRINCIPAL DE 1ÉRE CLASSE FERNAND MAXIMILIEN HIPPOLYTE VISBECQ

Medecin Chef de la Section Technique du Service de Santé, l'Armée française, et Secretaire du Comité Consultatif de Santé

I AM UNABLE, in a few minutes, to describe to you in detail the organization of the military operations which took place on the Verdun front, from August 20 to 26, 1917. I will only point out to you and explain the general outline, and afterwards I will tell you why I have specially chosen this subject.

TABLE 1

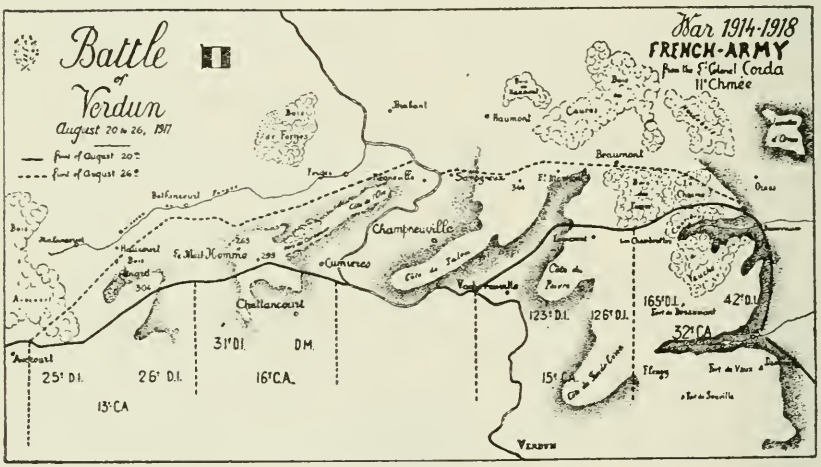


TABLE 2

VERDUN

From August 20 to August 26, 1917

AIM OF THE BATTLE

1. To enlarge the advantages of the preceding year.
2. To reconquer the region's observatories.

Forces engaged: The 13th, 16th, 15th and 32nd Army Corps—twelve divisions with two divisions in reserve.

600 batteries of artillery, 300 heavy—2,200 cannon.

Heavy artillery preparation began on August 13.

On August 26 the French troops seized the observatories and Verdun was free.

Statistics—From August 17 to August 27 there was—

One cannon for each nine meters of front.

Six tons of artillery projectiles for each meter of front.

The French troops captured 10,000 prisoners and 30 cannon.

(Lieut. Col. Corda)

TABLE 3

VERDUN

August 20 *to August* 26, 1917

A PART OF THE ORDERS TO THE MEDICAL SERVICE

General Principles

1. No sick or wounded man (including those able to walk) shall be sent to an army formation without passing through a corps formation (groupement d'ambulances) for the purpose of classification.

2. From the point of classification, all sick and wounded must be evacuated by automobiles (sanitary autos) no one going on foot.

3. Every man evacuated shall be given a slip showing that he has passed through the classification formation.

4. No one shall be evacuated on board a sanitary train except from a "Hôpital d'Evacuation."

Classification of the Sick and Wounded

1. Cases absolutely intransportable: to be cared for in formations close to the classification formation.

2. Serious cases: Transportable for short distances but not evacuable, to be cared for in the corps formation or in specially designated army formations according to the nature of the cases.

3. Evacuable cases (before or after surgical operation): To be removed to designated "Hôpitaux d'Evacuation Primaires."

4. Cases recoverable in a short time: to be removed to special corps formations or in cases of crowding to special army formations but under no circumstances to the "Hôpitaux d'Evacuation."

5. Cases suspected of voluntary mutilation: to be sent to special formations.

TABLE 4

VERDUN

August 20 to August 26, 1917

RESUMÉ OF THE PLAN OF EVACUATION AND HOSPITALIZATION

o = points de rassemblement; ● = points de chargement in sanitary autos; h.o.e. = Hopital d'Evacuation.

			13th Corps	16th Corps	15th Corps	32nd Corps
By motor cars....	Recuperation in a short time.		of the o To Villesur-Cousance. Julvecourt. Camp du Raton.	of the o To Julvecourt Souchesme-Bonton.	of the o To Souchesme-Bonton.	of the o To Camp de Sommedieu.
	Evacuables.		of the o To h.o.e. of Ste. Menehould.	of the o To h. o. e. of Villers-Daucourt.	of the o To h. o. e. of Fleury-sur-Aire.	of the o To h. o. e. of Dugny.
By sanitary autos specially.....	Absolutely intransportable.		of the ● To Brocourt.	of the ● To Clairs-Chenes.	of the ● To Glorieux.	of the ● To Beaulieu-Bevaux.
	Serious cases inevacuable for a time; hospitalized at		Brocourt Ville-sur-Cousance. Froidos.	Fontaine-Bonton, Ravin de Placy.	Landrecourt.	Dugny (hospitalization 1).
	Evacuable.		of Brocourt To h. o. e. Froidos and if crowded, to Sainte-Menehould	of Clairs-Chenes. To h. o. e. Vadelaincourt and Vadelinecourt pulled down (avion) to h.o.e. Fleury-s-Aire, and if crowded, h. o. e. Villers-Daucourt.	of Gloriaux. To h. o. e. Souilly, and if crowded, h.o.e. Fleury-s-Aire.	of Beaulieu-Beavaux. To h. o. e Dugny and if crowded, h.o.e. Fleury-s-Aire. N. B. (1). Dugny (hoson) pulled down (Arty) to Maujouy Dieue.

Policy: In the area of every Corps by the Generals Commanding the Corps. In the area of the Army: Cavalry and "Gendarmerie" shall settle a "barrage" on the line: Auzeville, Dombasle, Sivri-la-Perche, Fort de Sartelles, Thierville, Montgrignon, Faubourg Pave, Porte Saint-Victor, Caserne Bevaux, Ferme de Bellevue; and, on the left bank of the Meuse, on the line of the "Centres de Groupement" or the non-serious cases.

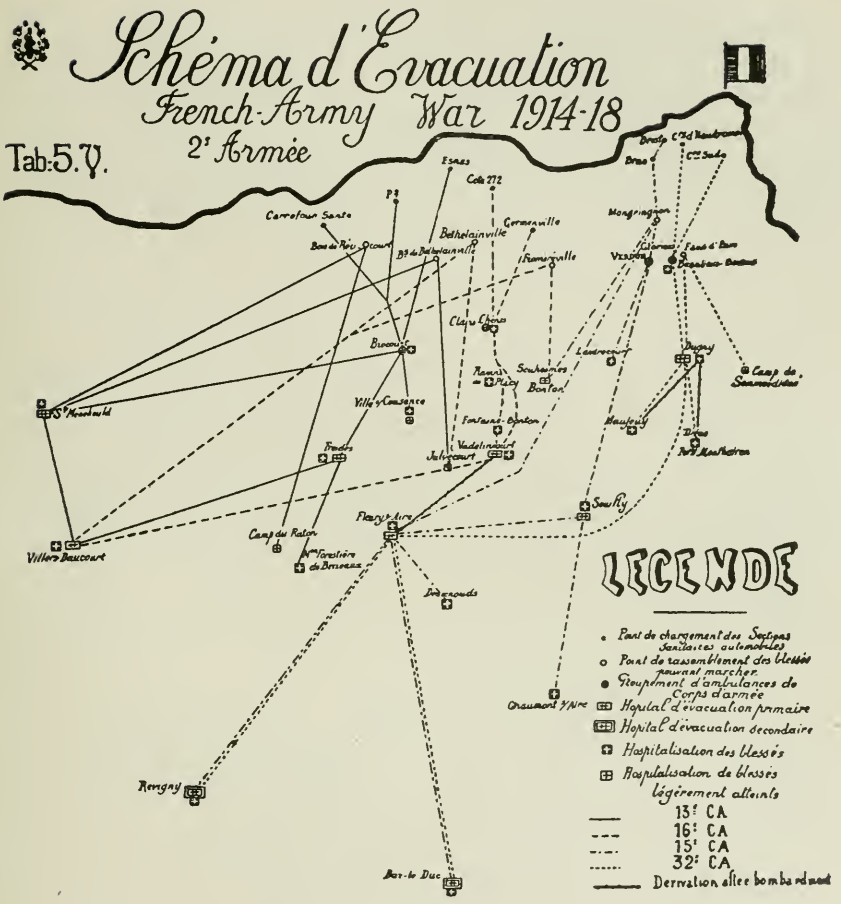


TABLE 6

VERDUN

August 14th to 26th

CASUALTIES

Casualties per Corps

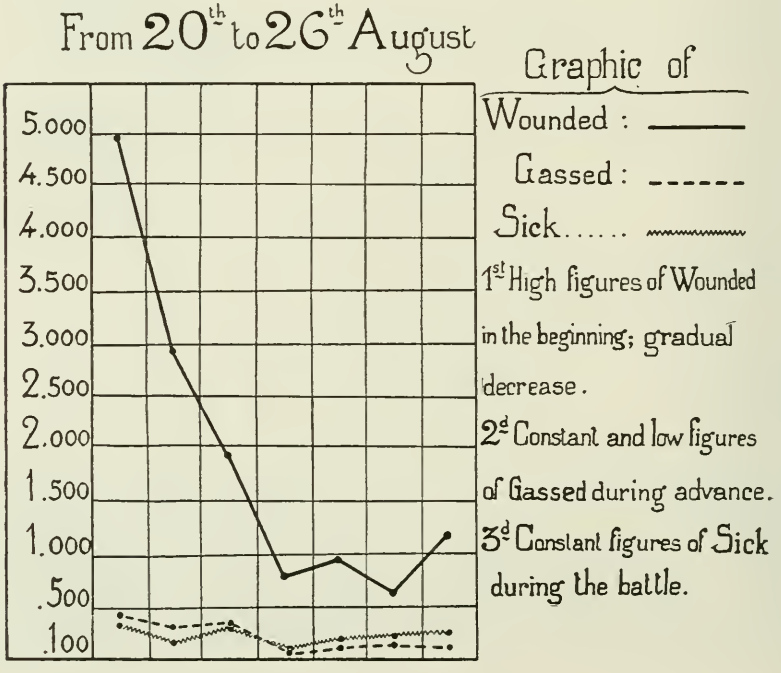
	Preparation period (Aug. 14 to 19)					Activity period (Aug. 20 to 26)				
	13thC	16thC	15thC	32nd C	Total	13thC	16thC	15thC	32nd C	Total
Sick.....	660	472	728	687	2,547	399	411	667	696	2,173
Wounded....	783	509	628	812	2,732	3,155	2,495	4,140	4,705	14,495
Gas.....	916	330	1,062	260	2,568	1,181	406	783	263	2,633

Daily Evacuations from the Corps Formation to the Army Formations

	August 14 to 19							August 20 to 26							
	14	15	16	17	18	19	Total	20	21	22	23	24	25	26	Total
Sick	433	353	339	310	316	428	2,179	295	229	290	213	214	202	208	1,631
Wounded	680	545	431	382	323	944	3,305	4,985	2,945	1,070	722	872	669	1,248	12,511
Gas	73	51	70	244	604	746	1,788	478	339	292	269	167	170	121	1,

Work of the Hopitaux D'Evacuation from August 14 to 26

H. O. E. of	Entries coming from the front	Evacuated to Etapes	
		Inland	Armies area
Souilly	3,726	702	2,568
Vadelain-court	4,415	1,760	2,652
Dugny	2,821	743	1,224
Froidos	2,886	144	1,787
Fleury sur Aire	5,907	439	5,325
Ste Menehould and Villers-Daucourt	1,947	122	1,723
Total	21,702	3,910	15,279



I have chosen this subject because:

First, the results obtained by the Service de Santé have been excellent.

Second, in order that, if you desire, you may study in what manner you would have proceeded under the same circumstances, applying your actual regulations, with the formations actually at your disposal.

To make this thirdly clearer, I will ask the commanding colonel of the School to allow me to offer these tables, as well as those concerning the statistics, to the School's Library. Here are more detailed maps of the region.

You all know Verdun, as you have fought there, therefore you will find, on these maps, names familiar to you.

You must remember, I feel sure, that certain of the evacuation hospitals in that region were put at the disposal of your army. And we also remember, with a great sentiment of gratitude, how the United States sent us, at a very critical time, 2,000 Ford cars, with the help of which your countrymen went out so courageously carrying the wounded to the *Postes de Secours* under the shell fire of the enemy.

STATISTICAL DATA RELATING TO THE FRENCH MEDICAL SERVICE DURING THE WAR, 1914-1918

LE MEDECIN PRINCIPAL DE 1ÉRE CLASSE FERNAND MAXIMILIEN HIPPOLYTE VISBECQ

Medecin Chef de la Section Technique de Service de Santé, l'Armée française, et Secretaire du Comité Consultatif de Santé.

EACH of these tables is meant to illustrate a principle or a law derived from our war statistics. The knowledge of the fact thus established will permit the heads of health services to establish previsions founded on experience.

TABLE I.—*Effective Forces*

Total, 8,882,000.

Of whom 2,700,000 (average) were on the French front.

Therefore, it was necessary to mobilize about three times as many men as were required at any time on the French front.

The last war was divided into three periods:

1. Short open operations.
2. Long trench operations.
3. Short open operations.

TABLE II.—*Casualties*

1. For every 1,000 inhabitants, France has lost 37.5 mobilized men.

Deaths = 1,325,000.

Of these the number killed = 674,000
Missing = 225,000
Dead from wounds = 250,000
} 86% of the total

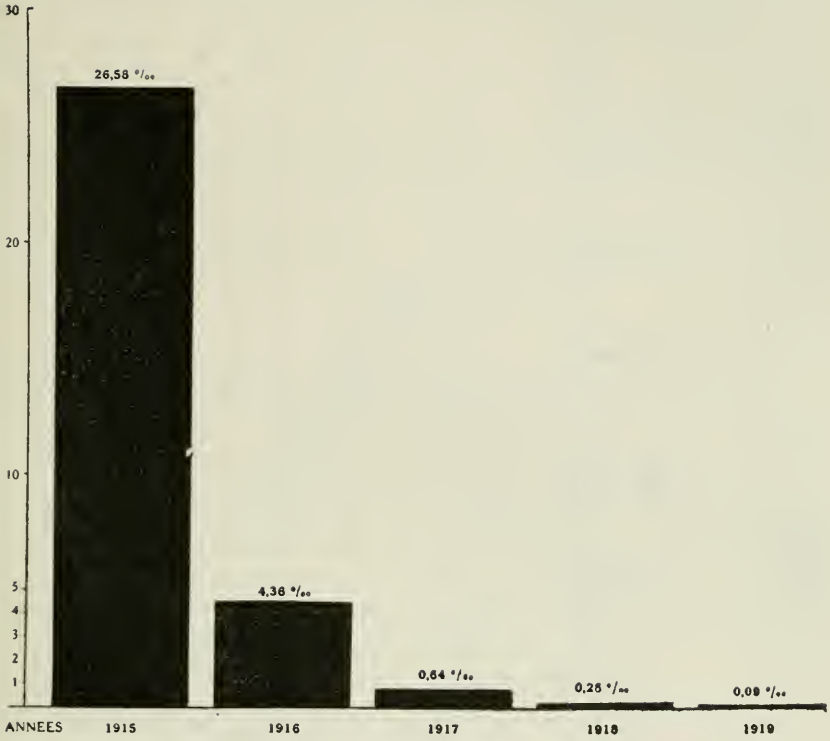
Dead from disease—175,000 } 14% of the total

CONCLUSIONS

1. Great improvement of the arms (especially artillery) over former wars.

Great improvement in hygiene and sanitation over former wars.

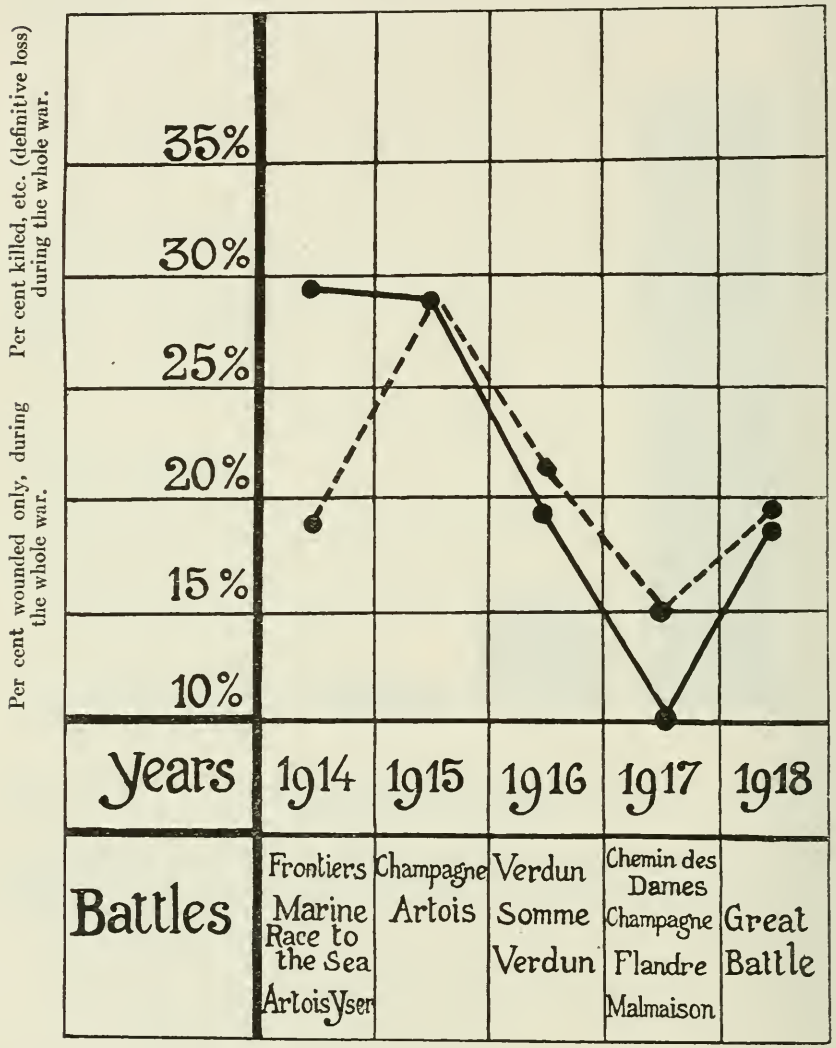
TABLE III



Results of Typhoid-paratyphoid prophylaxis: Morbidity from typhoid diseases in the Armies

(From M. le Médecin Inspecteur General Vincent, Directeur du aboratoire de vaccination antityphoiique et de sérotherapie de l'Armée.)

TABLE IV.—*Percentage of the casualties in the several periods of the war.*



CONCLUSIONS

1. Decrease in the number of casualties during the last years of the war.

2. There is not a constant relation between the number of killed, etc. (definitive loss) and the number of wounded.

The classic formula: 3 or 4 wounded for 1 killed may hold good for a whole war, but is liable to be wrong for an episode only.

TABLE V.—*Ratio of Gunshot Casualties to Gas Casualties in* 1918.

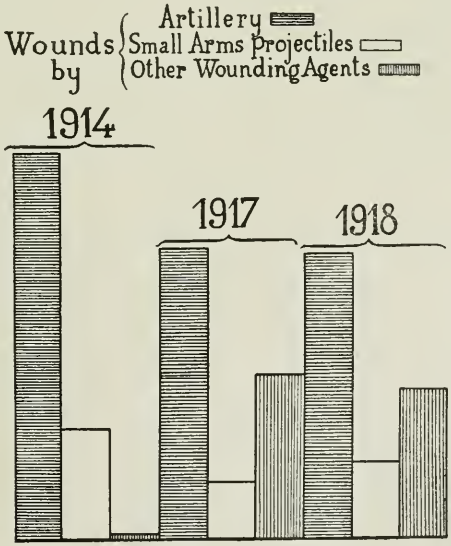
March to June	April-May	June	Final week of the war
French troops back	Stabilized front	Open operations	French troops advance in Belgium
Gas: 3% and 8% Gunshot: 97% and 92%	Gas: 40% Gunshot: 60%	Gas: 11%, 17% and 30% Gunshot: 89%, 83% and 70%	Gas: 6% Gunshot: 94%

CONCLUSIONS

When troops advance or retreat rapidly (open operations), gas casualties decrease in relation to gunshot casualties.

When troops offer resistance (French operations), gas casualties increase in relation to gunshot casualties.

TABLE VI.—*Percentage of Wounds by Artillery, Small Arms Projectiles and Other Wounding Agents*



CONSEQUENTLY

1. Increase of the wounds by artillery relative to the preceding wars.

2. Artillery—for the whole war from three-fourth to a little more than one-half of the total.

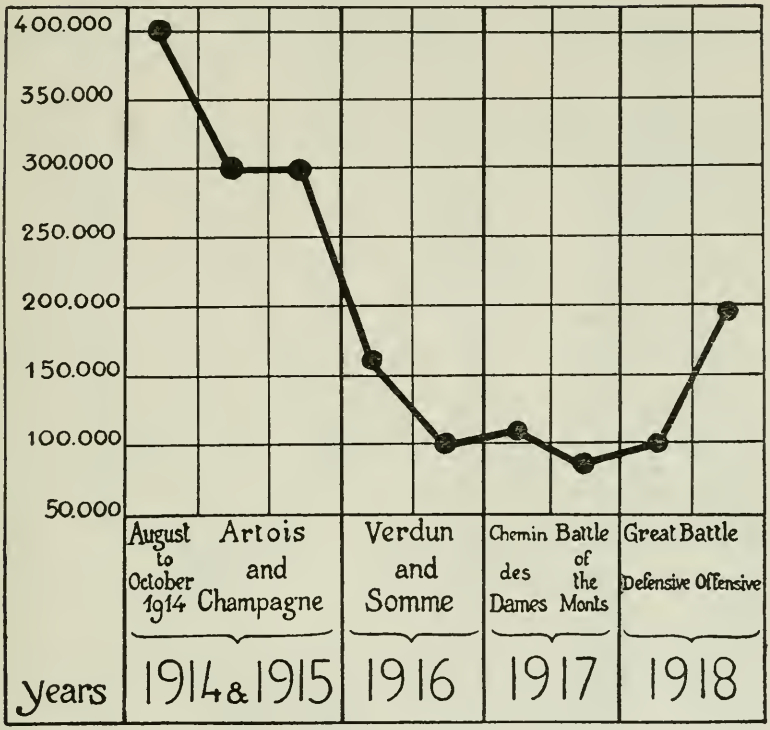
During 1914: Wounds by small arms $\frac{1}{3}$
During 1917: Wounds by small arms $\frac{1}{5}$
During 1918: Wounds by small arms $\frac{1}{4}$
} Ratio to artillery wounds

Other agents: At beginning—Insignificant.

Other agents: Later—$\frac{1}{2}$ of the total.

Comparison between various operations shows that the percentage of artillery wounds decreases with the mobility of the troops but does not fall below one-half of the total. The percentage of "wounds from small arms" increases with mobility but does not exceed one-third of the total.

TABLE VII.—*Evacuations to Inland (out of the area of armies) about 3,000,000 for the Whole War*



CONCLUSIONS

During the first 17 months 1914 and 1915	Few means of hospitalization at the front.
	Many evacuations to inland.
Intermediate period 1916 and 1917	Sufficient means of hospitalization at the front.
	System of evacuations to inland remains constant.
During the last 8 months 1918	French troops advance rapidly.
	Means of hospitalization at the front become insufficient.
	Many evacuations to inland.

TABLE VIII.—*Percentage of Evacuations by Sanitary Trains Between the Area of Armies and Inland*

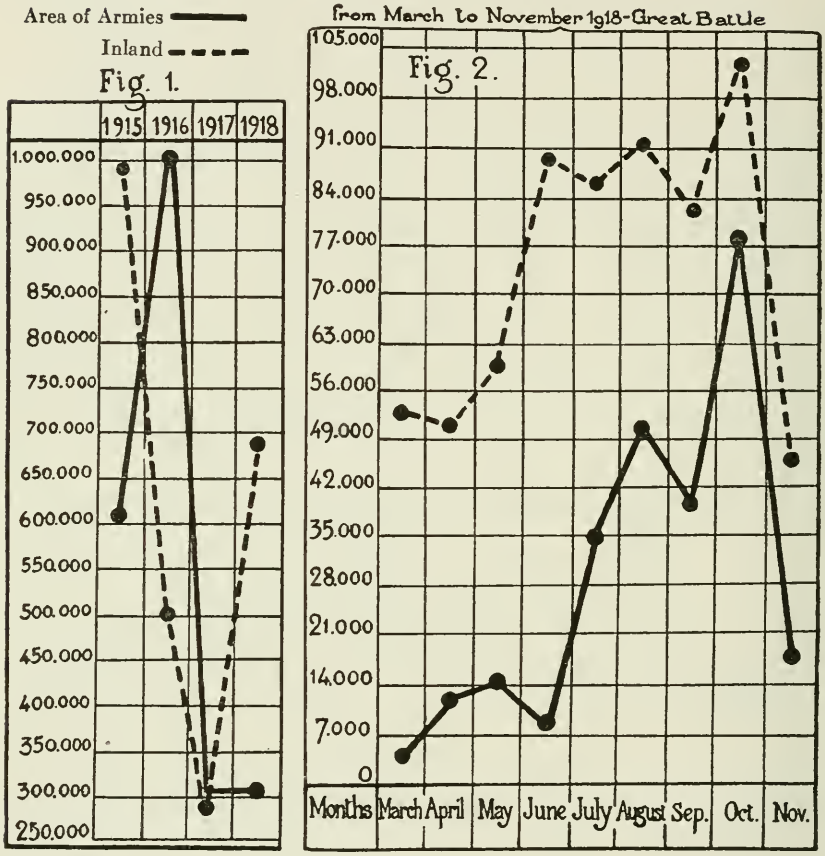


FIGURE 1:

1915—Insufficient means of hospitalization in area of armies in relation to the enormous casualties.

1916—Stability; resources in Area of Armies considerably increased.

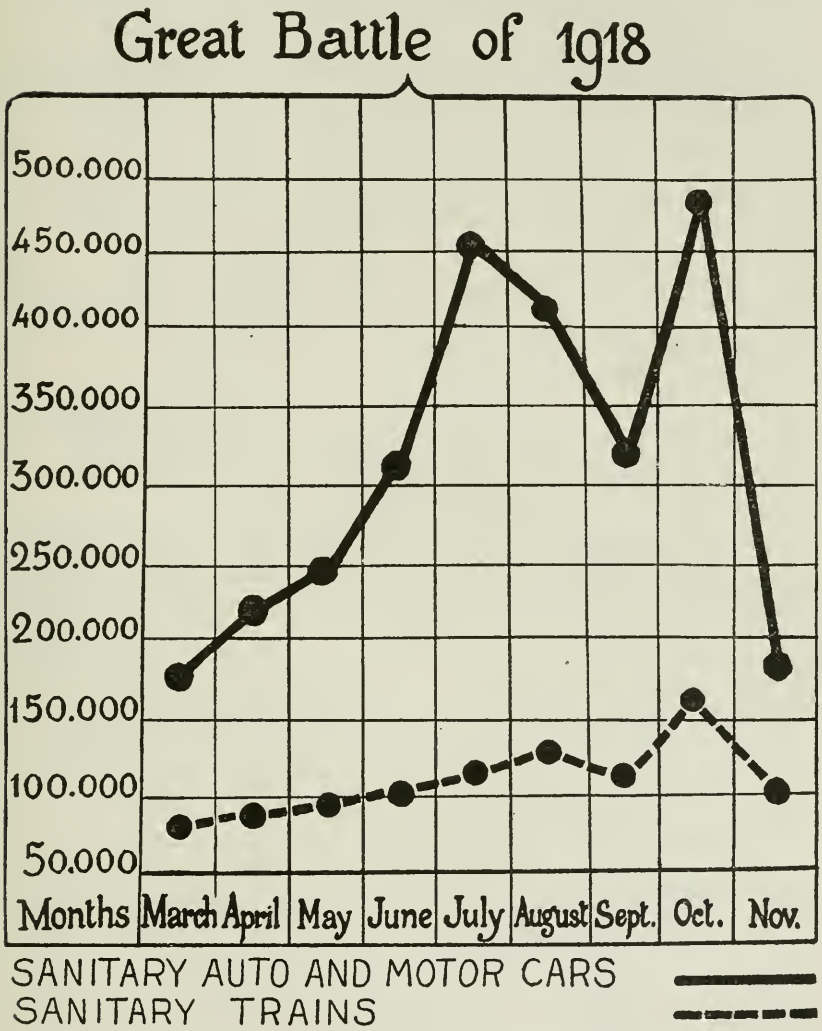
1917—Satisfactory.

1918—Rapid advance of French troops; increase of inland hospitalization.

FIGURE 2:

During the Great Battle (1918) monthly graphs are constantly parallel; excellent balance.

TABLE IX.—*Work Performed by the Transport Service*



The sanitary trains transported 5,000,000, more than 900,000 of whom were during the great battle of 1918.

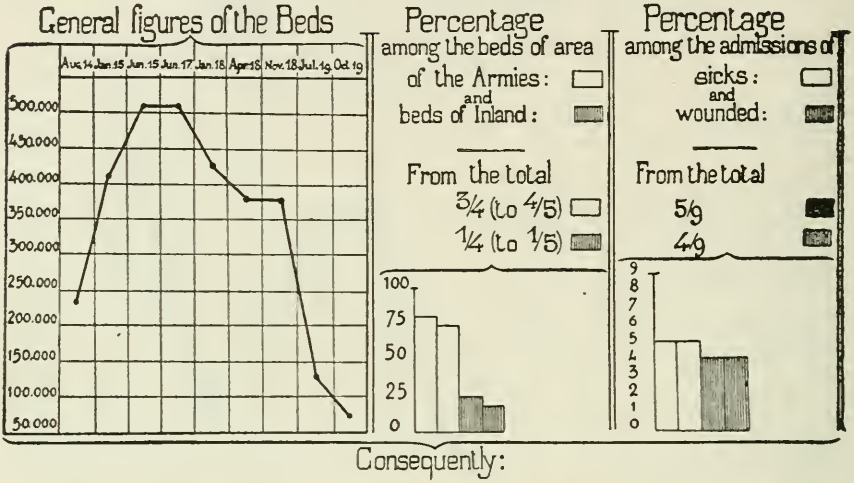
The sanitary autos and motor cars transported 10,000,000, more than 2,500,000 of whom were during the great battle of 1918.

Therefore:

The sanitary autos and motor cars carried about three times as many men as the trains. Some sick and wounded were carried several times. Probably about one-half of the sick and wounded and the slightly gassed were carried sitting in the motor cars.

TABLE X.—*Hospitalization*

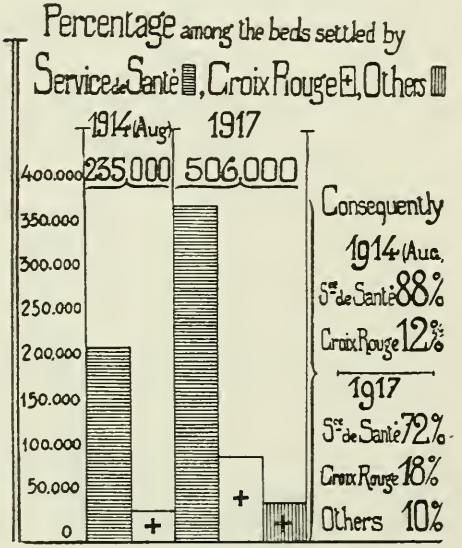
Approximately 9,000,000 admissions. (Some of the admissions concern the same man.)



Of the 9,000,000 admissions, 5,000,000 were sick and 4,000,000 were wounded. Formations of the rear were much more numerous than those of the front and received many more sick than wounded. Many wounded died before hospitalization (severely wounded; delayed hospitalization).

1917: About 2,500,000 men on the French front; number of men mobilized 7,000,000.

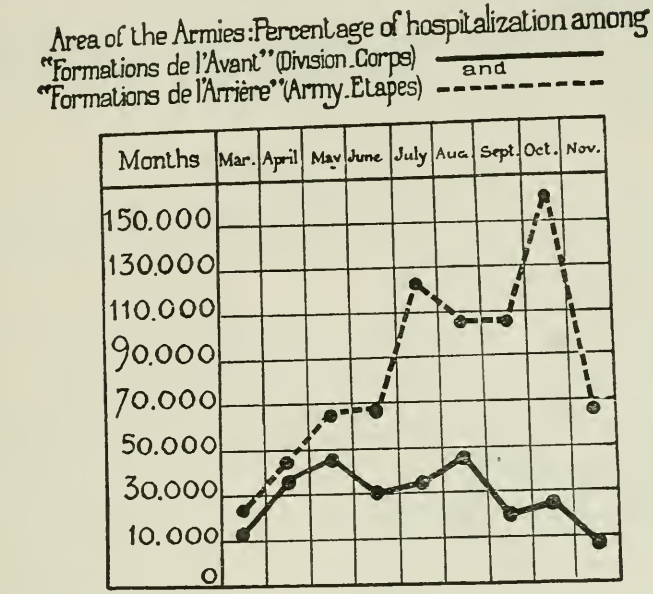
There was one bed in the interior for five in the area of armies.

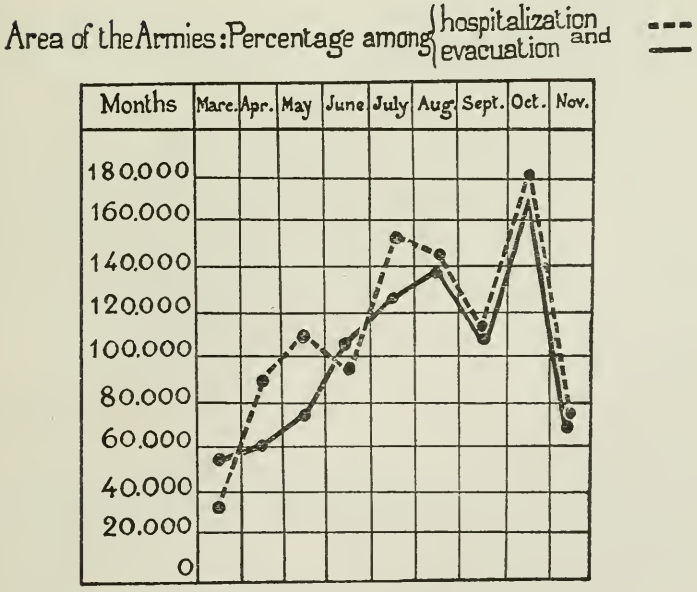


Percentage among the various specialties (inland):

For 4 beds of general surgery, it is necessary to have 2 beds of general medicine, 1 bed of surgical specialty and 1 bed of medical specialty.

TABLE XI.—*Variations of Hospitalization during the Great Battle*, 1918.





In area of the Armies:

"Formations d'arrière" (Army Etapes) perform the greatest work of hospitalization.

"Formations d'avant" rapidly attain their maximum and keep it.

In a great battle, "Formations d'arrière" cannot assure hospitalization and must evacuate as fast as they receive.

Table XII.—*Recuperation*

Number of men who were returned to the front after recovery:

1916—50,000 per month.

1917—47,000 per month.

1918—60,000 per month.

Monthly average during the whole war 55,000 to 60,000.

Loss resulting from evacuation nearly 60,000 per month.

In other words, 90 per cent recuperate.

Of the 100 men evacuated 90 recuperate. Of the 10 men lost, 1 dies and 9 are discharged.

Of the 90 men who recuperate:

⅔ recuperate after hospitalization in the armies in the course of an average time of one month.

⅓ recuperate after hospitalization in the interior in the course of an average time of five months. (Minimum: 2 months; maximum: 7 months.)

These figures demonstrate:

1. The valor of the soldier.
2. The foresight of the commander.
3. The technical value of the medical service.

Conclusions Drawn from the Statistical Data

1. Effective forces: 34 mobilized "classes" of which 11 were on the front. About 3 mobilized men for 1 on the front.

2. Annual loss: 250,000 men. About 1 "classe."

3. Ratio of delayed deaths to those instantly killed = 2:3.

4. Ratio of deaths from wounds to those from disease = 6:1.

5. Ration of gas injuries to gunshot wounds (at the end of the war) = 1:5.

6. Wounds by artillery have increased constantly in relation to those from small projectiles and formed three-fourths of the total.

7. Diseases: Only two have been important—typhoid (including para-typhoid) and grippe.

At the beginning typhoid and para-typhoid were very severe but

were soon stopped by vaccination. Grippe caused 12,000 deaths at the front lines.

8. Evacuations: the number at the beginning was high; decreased with trench operations; increased again with the defensive and especially the offensive battle of 1918.

The total was 3,000,000, of whom one-half to three-fourths were wounded.

9. Transportation: The sanitary trains transported 5,000,000 men. The sanitary automobiles and motor cars transported 10,000,000 (some of the men several times transported).

10. Hospitalization: Beds occupied were one-half to three-fourths of the total.

There was 1 bed to every 14 mobilized men.

Three-fourths of the beds were in charge of the Service de Santé; one-fourth in charge of the Red Cross.

There were 4 beds used for general surgery to 2 for general medicine, 1 for surgical specialties and 1 for medical specialties.

Hospitalization at the front was strong (chiefly army formations); in spite of this, army formations should be able to evacuate as many patients as they admit.

11. Recuperation: 90 per cent (⅔ after one month).

Loss: 10 per cent (1 died for 9 discharged).

I bring you the salute and all the good wishes of the Directeur du Service de Santé Militaire and of the Président du Comité Consultatif, who is proud to be numbered among the members of your Association of Military Surgeons.

I present my greatest thanks to the President of our meeting for having allowed Professeur Duguet and myself the pleasure of delivering these lectures. We consider it a great honor to have been able to speak in this school created to succor those fighting for their motherland.

To those of your countrymen who, in the course of the past and present history, have given their lives for the upholding of liberty in the world, I salute with respect.

REPORT OF THE MEDICAL COMMITTEE, INTERNATIONAL AIR RACES[1]

By Lieut. Col. M. B. CLOPTON, *Medical Officers Reserve Corps, Commanding Officer,* and First Lieut. LEE D. CADY, *Executive Officer, General Hospital No. 21, Washington University, St. Louis, Mo.*

(With one illustration)

The Reserve Hospital organization may from time to time be of civic as well as military use. In case of civic employment services may be rendered in such a way that no hardship is entailed on the members of the organization. Such an occasion arose at the International Air Races held at the Lambert-St. Louis Field, October 4, 5, and 6, 1923. These races were participated in by the Army, Navy, Marine Corps, the Air Mail Service and civilian flyers, the last group representing a relatively small proportion. The actual preparation and direction of the meet was under the military supervision of Gen. Mason Patrick, Chief of Air Service, U. S. Army, and Admiral Wm. A. Moffatt, Chief of Air Service, U. S. Navy. Sufficient military personnel was ordered to the field in all branches except the medical. Only one regular officer of the latter branch, Capt. I. J. Gibson, was assigned to the medical needs of several hundreds of contestants, mechanics and soldiers, without any adequate equipment.

The problem of securing suitable and adequate medical personnel and equipment fell largely upon the administrative officers of the reserve hospital organization used, and required time and effort for several weeks preceeding the races. Other persons serving were thus spared any sacrifices other than the time consumed while they were actually on duty. Other problems and accomplishments will be better described in succeeding paragraphs under their proper headings.

STATIONS

The number and location of stations was determined by repeatedly going over the surveyed course by automobile and aeroplane. Two hospitals were erected on the grounds at Bridgeton. One was on the field near the hangars, with a bed capacity of 15, together with a fully equipped dressing station to take care of injuries or accidents occurring on the field, particularly for those men actively engaged in flying or with preparations for flying. The other hospital of the same capacity

[1] The initiative which General Hospital No. 21 displayed in voluntarily adapting the hospital unit to service at Lambert Field evidences an interest in the training of reserve units in time of peace.

The Surgeon General takes pleasure in congratulating the personnel of General Hospital No. 21 for having inaugurated a fine service to the community and the Army which concurrently affords an opportunity for training in mobilization and operaton of the Unit for the emergencies of war.

M. W. IRELAND, Surgeon General.

and equipment was erected behind the grandstand to take care of the spectators. Arrangements were made, through the kindness of the superintendents of the institutions at Barnes Hospital in St. Louis and St. Joseph's Hospital in St. Charles, to take care of such cases as needed further hospitalization.

Seven ambulances were provided; three of these were furnished by the Army, two by the city of St. Louis, one by a firm in St. Charles, and another private ambulance by a firm in St. Louis. The two army ambulances were kept on the field at all times, and the stations for the other ambulances were: one at each of the outlying pylons, one each at the two crossings of the Missouri River, and another ambulance was constantly on duty at the hospital in the spectators' area.

There were three motor boats fully equipped to take care of any accidents on the Missouri River. These were secured by and under the orders of Commander Schwartz of the Naval Reserves.

There were nine motorcycles with side cars (furnished by the Motorcycle Club of St. Louis), and four motor trouble cars (furnished by the Automobile Club of Missouri) distributed throughout the course, each one of which had a medical officer with first-aid equipment.

A medical officer and equipment was also assigned to a railroad speeder on the Burlington Railroad with the station at Machens (contracted for by the *St. Louis Star*).

EQUIPMENT

The equipment for the hospitals and medical officers on the ambulances, motor boats, motorcycles and trouble cars was very generously offered to us by the Surgeon General of the Army, and was obtained from the field hospital equipment in storage in the Intermediate Supply Depot, commanded by Lieut. Col. J. B. Huggins.

The equipment was adequate in every way and allowed some of the unit to become familiar with field hospital equipment. It also saved us the expense of purchasing. The equipment was all returned to the Government after it was used.

Besides the equipment obtained from the Government, each ambulance and motorcycle was fitted with what was known as "crash equipment." It consisted of wire-cutters, hacksaws, axes, fire extinguishers, and a coil of wire. The "crash equipment" was obtained locally, part by purchase and part lent to us.

PERSONNEL

The problem of furnishing adequate medical personnel was solved by utilizing the General Hospital No. 21, a reserve hospital formed at Washington University School of Medicine, about which, as a nucleus,

was knit an efficient volunteer service. This nucleus consisted of only 23 officers, including those commissioned but not at that time actually assigned to the organization. Twenty-eight practicing physicians and resident hospital men, who for the most part had had previous military experience of some sort, were easily secured to fill up vacancies for the time being on the field and course. Twenty-six older and more prominent surgeons were present among the spectators and were available should their services have been needed. The Red Cross furnished six nurses, two of whom were on duty each day in the hospital assigned to the spectators. Forty-two medical R. O. T. C. and former service men (all of whom were advanced medical students) were used in the capacity of medical enlisted men. Ten of these men were from the Medical R. O. T. C. from St. Louis University. Eighteen or more drivers were furnished daily by the Army, St. Louis City Hospital No. 1, St. Joseph's Hospital, two private firms, the Motorcycle Club of St. Louis, and the Automobile Club of Missouri.

In St. Charles, three reserve medical officers were on duty at St. Joseph's Hospital each day of the races, and they also furnished one medical officer for the ambulance which went out from St. Charles. One medical officer of the Naval Reserves served each day on one of the motor boats on the Missouri River.

We were fortunate to have the very active cooperation of Capt. I. J. Gibson of the Regular Army Medical Corps, who is surgeon to the aviation unit that came from Chanute Field. He was on duty all the time and took charge of the tent hospital near the hangars. We assigned to him two reserve officers and five R. O. T. C. men.

SERVICES RENDERED

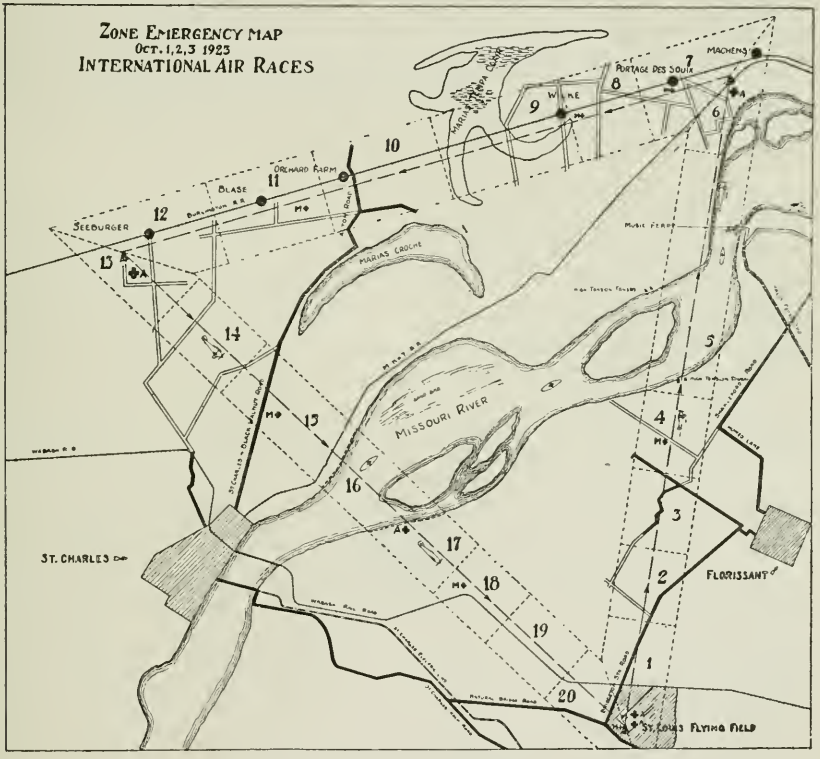
This preparation covered, as far as we could foresee, any contingency. Fortunately, there was no serious accident. Several planes came down and a few were demolished. None of the pilots were injured sufficiently to require serious medical care. In the Pulitzer Race, Lieutenant Sanderson of the Marine Corps had a crash just outside the flying field which completely demolished his machine, but he escaped without any more serious injury than a sprained ankle and a few cuts and bruises. An ambulance and four motorcycles reached him almost immediately.

On the day after the races, a parachute jumper sustained a fracture near the shoulder and was transferred immediately to Barnes Hospital.

There were very few minor scratches and hurts among the spectators and the police that were attended to at the dressing station near the spectators' stand. There were one or two cases of illness which were handled by admitting the patients to the hospital for a short time and, in one instance, sending the patient home in an ambulance.

LIAISON

During the races, constant information was obtained from the officers at the telephone on the timers' stand, advising of the exact position of the planes. In the few instances of forced landing we were able to know immediately the position of the planes, to ascertain that the pilots were walking about, being advised of this by the judges stationed on top of the pylons. Should it have been necessary, we could have sent the ambulance into any given area as marked on the Emergency Zone Map appended hereto. In no instance was there any need for the ambulance, except to take a medical officer to a downed plane. There were no fires in the fallen planes.



CIVILIAN COOPERATION

Mention must be made of the civilian physician's willingness to help this reserve organization accomplish its undertaking. Among the interne staffs of the hospitals fully 95 per cent of the men approached freely volunteered their services. The R. O. T. C. students were just as eager to serve, even though it meant that they would fall behind

several days in their classes. Indeed, several internes and R. O. T. C. men were not a little disappointed because they were not able to be used except on the reserve list which was maintained to fill vacancies which might have occurred at the last moment.

SUMMARY

General Hospital No. 21, having fourteen officers actually assigned and nine more who have applied for assignment, in conjunction with fifty-four practicing physicians, surgeons and internes, six Red Cross nurses, forty-two R. O. T. C. students, and eighteen drivers, prepared for and maintained adequate medical facilities to care for any medical emergency which might have arisen among the hundreds of aviators and soldiers, and tens of thousands of spectators during the International Air Races held at the Lambert-St. Louis Field at Bridgeton, Mo., October 4, 5, 6, 1923. All service rendered was voluntary. Only a few injuries of minor consideration were sustained by flyers or spectators.

A CASE OF RETINAL DETACHMENT IN A PILOT OF THE AIR SERVICE U. S. ARMY

By Major H. C. NEBLETT
Medical Corps, United States Army

IT IS BELIEVED a report of this case will be of interest because of the obscurity of its etiology, its insidious development, and to certain unusual factors that appear to have played a definite part in its progress throughout a period of twenty-six months. No attempt will be made to attribute the cause of the condition to any factor or factors connected with the duties of a pilot. In that connection it is desired that the reader make his own deductions from the history submitted in the case.

Case History.—The patient, a muscular and well-developed individual, twenty-four years of age, had served four and one-half years in the army, the last three years of which he served as a pilot in the air service. Family history and past history negative for any factors that may have had bearing on the eye condition. The pilot stated that during his period of service all of the many examinations of his eyes had been negative prior to September, 1919, and prior to that time had not experienced any trouble with either eye. He always wore goggles while flying, had never suffered an injury to his head or eyes, and had never worn glasses. In September, 1919, while piloting an airplane at an altitude of 8,000 feet, and preparatory to landing, he fell into a series of "tail-spins," rapidly losing altitude, to within 1,500 feet of the ground. At the latter height he suffered a severe pain in the right side of the head and the right eye, which was immediately followed by photophobia and blurring of vision in both eyes. These symptoms were so severe it became necessary for him to remain in the air for about fifteen minutes before his vision had cleared sufficiently for him to attempt to land his plane. Very soon after landing the left eye became normal, but the symptoms in the right eye continued without appreciable relief until after a period of about ten days' treatment. Following this no further trouble was experienced with the eyes except that the right would become very easily tired while reading or while flying over a moderately protracted period of time. About six months later the above symptoms in the affected eye were more pronounced and, in addition, there was some dimness of vision and flashes of light before the eye. These symp-

toms continued with slight remittance until July, 1920, at which time he was given the prescribed (609) examination for pilots and was temporarily disqualified for flying status on account of diminished visual acuity in the right eye with less than one degree of hyperphoria present.

After one month's treatment and rest he was reexamined and qualified for flying duty, a waiver being given for the affected eye. From that time no further increase in symptoms in the eye were noted until December, 1920, while piloting a plane and landing "into the sun" he again suffered pain and blurring of vision in the right eye. Treatment was again effectual in relieving the pain and somewhat improving the vision. Following this no material change was noted in the right eye until March 10, 1921, during a cross-country flight of about five hours' duration at an average altitude of 6,000 feet. During the latter part of this flight, pain, photophobia and dimness of vision were quite marked in the right eye. Rest and treatment again resulted in a partial relief of all symptoms.

On July 21, 1921, pilot's plane was wrecked in a crash at sea in which he suffered a very severe fall but without any definitely localized injury. This was immediately followed by a rather severe recurrence of all previous eye symptoms. Examination of the pilot resulted in disqualification for flying duty on account of defective vision in the right eye. For a period of three weeks from that date he was under observation and treatment and on August 17, 1921, was again examined with no material improvement evident in the eye. Rest and treatment of the eye was resumed, and on September 5, 1921, he was again examined and the eye was found to have sufficiently improved to barely come within the limits of the waiver permitting a resumption of flying status. During the first week of November, 1921, following a cross-country flight of 300 miles, he again had trouble in the right eye. Of further interest in this case was the unusually large number of crashes and poor landings made by this pilot during his period of service.

It is desired that it be noted here that all the above data in this case were extracted from the history given by the pilot. Consequently, early signs and symptoms that may have given diagnostic evidence of the true condition existing in the eye are omitted for lack of previous knowledge of the case.

The writer's attention was first attracted to this pilot on November 20, 1921, while he was making practice landings in a

single-seated plane. It was noticed that in making two attempts to land he showed a marked error in judgment in "levelling off" and at the same time allowed the left wing of the plane to dip considerably. His third attempt to land his plane resulted in demolished it by striking the ground heavily on the left wheel and wing. There was no injury sustained by him. Immediately following the accident he was given a careful examination, special care being taken in examination of the eyes. The left was normal. The right showed markedly diminished visual acuity to the usual tests for flying and for ordinary vision. In addition, there was considerable narrowing of the supra-orbital and temporal fields of vision. An examination of the eye ground revealed an almost complete detachment of the retina from below. The detachment was seen as grayish ribbon-like folds with a loss of the light reflex of the blood vessels at various points. The diagnosis was confirmed by two other medical officers, one an ophthalmologist. The diagnosis was later confirmed at a general hospital to which the case was immediately transferred. Treatment at the latter place for three months was without beneficial results, and the pilot was retired from the service on account of practically total blindness in the affected eye.

In so far as flight surgeons are concerned in the examination and care of pilots, it seems that this case points out the necessity for a very thorough examination of the eyes in the case of any pilot who previously had normal vision but who, following a crash or from any unusual circumstances connected with his vocation, complains of or shows a diminution of acuity of vision in either eye, with or without flashes of light before the eye, blurring of vision or photophobia should be looked upon with suspicion of beginning retinal detachment.

A PLEA FOR AN IMPROVED STEEL HELMET IN THE NEXT WAR

By ADOLPH M. HANSON, M.D., B.A., M.A.

Formerly 1st Lieutenant, M. C., U. S. A., Neurosurgeon Evacuation Hospital No. 8, A. E.F.

(With two illustrations)

THE VALUE of the steel helmet was appreciated early in the war by the Allies as well as the Germans. The helmet worn by the English and our forces differed very little from those worn by the French. The French helmet was lighter, but offered a little more protection for the forehead and occiput than the English helmet. The German helmet, while it did not afford as secure a protection for the parts covered by the English helmet, nevertheless afforded a much greater protection, in that not only the cerebrum but the cerebellum and the upper portion of the medulla as well were protected.

Fig. 1 illustrates the portion of the brain protected by the English helmet, and Fig. 2 the protection afforded by the German helmet.

The writer secured information from German sources early this year, but the translations and originals have been lost, so that he cannot offer the statistics they contained. One German division reported head injuries constituting only a little over 3 per cent of all wounds. In the allied armies, head injuries constituted 10 per cent of all wounds. There is no doubt in the writer's mind, after seeing reliable statistics, in which head wounds were shown to constitute from 3 to 4 per cent of all wounds, that the German helmet was far superior to any worn by the Allies, even though it must be admitted that the

Fig. 1

Fig. 2

English helmet gave the best protection for the parts covered. The English helmet was, however, imperfect, in that it did not protect the most vital centers.

It will never be known how often projectiles harmlessly glanced off. Because of the use of the helmet, what formerly would have been slight injuries escaped altogether; penetrating wounds became non-penetrating; and many severe wounds, which would have been fatal at once, reached the surgeon alive.

Col. Percy Sargent and Capt. Sidney Smith of the British Army reported, early in the war, a study of two series of head injuries—200 in which no helmet was worn, and 122 in which the helmet was worn at the time of injury. They summarize their cases in the following tabular form:

TABLE 1

	Cases without helmet	*Cases with helmet*
Total examined	200	122
Dura unperforated	56	61
Percentage escaping	28%	50%
Total examined	200	122
Evacuated to England	127	103
Percentage mortality	36.5%	15.5%
Total dural perforations	144	61
Evacuated to England	73	43
Percentage mortality	49.3%	29.5%
Cases of dural perforation operated upon by us.	73	40
Evacuated to England	40	28
Percentage mortality	45.2%	30%
Cases of dural perforation operated upon before admission to base	37	20
Evacuated to England	19	15
Percentage mortality	48.6%	25%
Cases without dural perforation	56	61
Evacuated to England	54	60
Percentage mortality	3.5%	1.6%

In cases with retained missiles, the following interesting table is given:

TABLE 2

Situation of foreign body	*Cases without helmet*	*Cases with helmet*
Deep in brain	27	10
Just inside skull	3	4
Embedded in bone	2	10
In scalp	6	7
Total	38	31

In Table 2, four cases, in which the foreign body was a piece of steel helmet, are included under "Cases with helmet."

In reference to the region affected, they give the following table:

TABLE 3

Region wounded	*Cases without helmet*	*Cases with helmet*
Frontal	27%	25%
Parietal	36%	36%
Temporal	17%	16%
Occipital	20%	19%
Cerebellar	....	4%

They comment on this with the following words: "The two noteworthy points in this table are the close correspondence of the percentages for the four cerebral regions, and the relatively high proportion of cerebellar injuries in the helmet protected cases."

The percentage of cases in reference to the region wounded would naturally be the same, but the observation made, already so early in the war, showing the relatively high percentage of cerebellar injuries in the helmet protected cases, may be readily understood if the reader will refer to Fig. 1.

The helmet did not only prevent many head wounds, but it also changed the character of the wounds. A heavy piece of spent shell, striking a helmet, would produce a bruising of large areas of scalp. Linear fractures were more common, and fractures of the base, due to a more general distribution of the lines of force from the impact of the helmet, were more frequent. Very often, scalp wounds were produced by the helmet and not by the missle itself. One case, operated upon by the writer during the Meuse-Argonne offensive, complained bitterly of pain in his neck and lower jaw. He was hit by a sniper's bullet, which broke the strap of his helmet, driving the helmet from his head and producing an indriven fracture near the vertex in the fronto-parietal region to the left of the longitudinal sinus. This case, following a costo-chondral graft for the repair of his skull defect, is now a useful

citizen, in spite of a partial spastic hemiplegia, involving the right side. He is able to walk with only a slight limp; shake hands, though his action is slow; and mounts and rides his own horse. This case had linear fractures, extending in a radiating manner from the opening of the depressed fracture.

An improvement in the steel helmet, so that it will more effectually cover the brain, will prevent many injuries of the cerebellum, and render many, heretofore, serious or fatal wounds, less serious.

DESERTION: OBSERVATIONS OF A PSYCHOANALYST

By Commander J. C. THOMPSON
Medical Corps, United States Navy

THIS article touches upon the cause of desertion from the viewpoint of a psychoanalyst; also a thoroughly practical working plan, which, if given a trial, may be counted upon to markedly decrease desertion at a large army camp or naval training station.

As to the cause of desertion, it is assumed that there will be an acceptance of the elementary underlying principles of Freudian psychology, one of the tenets of which is to the effect that "the rolling stone," the "man who won't fit in," the "temperamentally unfit," and the "all-round misfit" are merely euphemistic phrases to describe men who in psychological language have a neurotic constitution.

The symptoms of a neurotic constitution range from minor personal mannerisms, such as irritability, sensitiveness, obstinacy, egotism and absent-mindedness to the terminal mental delapidation found in the incurable ward of the asylum.

The military crime of desertion is a neurotic symptom. It is a manifestation of one of the devices made use of by the neurotic to bring about an escape from reality. The symptoms of a flight from reality may vary widely, from the minor ones such as becoming bored, feeling tired, restlessness, irritability, fault finding, and excessive cigarette smoking, on to drinking, and from these to the serious dementias or the final and complete escape from reality—suicide.

Even though desertion be regarded as a neurosis, a mild mental disorder in that it is childish conduct on the part of an adult, this memorandum will not contain the slightest hint that after a deserter has been apprehended he should in any way be treated differently than is now the routine. This memorandum will therefore not contain a suggestion even of any innovations criticising the time-honored customs of the Judge Advocate's Department. This memorandum will, however, clearly show how the number of desertions can be reduced, thereby reducing the number of civilian offenders, as each deserter is actually a criminal.

In that desertions are a definite source of financial loss to the Government any efforts tending towards their reduction would be strictly in accordance with one of our foremost policies, that of economy.

One of the most distinguished Freudian scholars in Europe has made a critical psychological study of deserters. The following résumé is virtually quoted from his recent work. He writes:

At least half the deserters are definitely weak minded and mentally defective. They exhibit many forms of childhood behavior. The majority have run away from home to begin with, and the desertion is therefore not their first flight from restraint. Deserters almost invariably suffer from childhood fears of the father; these fears and the secondary hatreds engendered are unconsciously transferred to their instructors, and in consequence these recruits have a morbid fear of their drill masters. Many suffer from abnormal mother attachments; the end product of which is homesickness, and finally a return flight to the nest—desertion.

As a matter of fact the deserters are almost wholly engaged in the flight from their own intolerable emotions, and a careful investigation will evidence that their emotions come from phantasy, from faulty thinking, from unconscious thinking and not from rational conscious thought definitely directed to reality, to the actual problems in life confronting the individual. These are some of the far-reaching observations made by Dr. Victor Tausk.

Another tenet of the psychoanalytic school that it is necessary to mention in order that the subject of the reduction of desertion be approached with appropriate understanding is to the effect that many minor outbreaks of misconduct can be averted, as soon as the individual can be brought to a thorough realization of the underlying motives upon which the proposed evil act is based.

This is the crucial point of the thesis of this memorandum; it explains the mechanism of the particular kind of help that can be extended an active malcontent who is contemplating desertion.

The following tentative plan is offered:

(*a*) The War or Navy Department to detail to large recruit cantonments or naval training stations a medical officer skilled in the psychoanalytic technique.

(*b*) The duty of this officer to be strictly confined to the endeavor to reduce desertions from the service.

(*c*) That this duty be absolutely devoid of any suggestion of interference in any way with the routine discipline of the camp or station. The officer to have absolutely nothing to do with offenders against the military code, these cases to be completely beyond the pale of his work. His work, to restate it, to be confined to the endeavor to prevent desertion. After a man deserts and is apprehended, the act of desertion to automatically remove his case from the purview of this work.

(*d*) The minor details of the duty would consist in:

1. A suitable, quiet office.
2. A couple of hospital corps men, chosen by the officer for their known usefulness in this particular work.
3. These hospital corps men to make contact with malcontents and induce the discontented ones to lay their troubles before the analyst.
4. The results of these interviews to be strictly of a confidential nature between the analyst and the man.
5. The help to the man and to the service to come entirely from the personal instruction given in the art of thinking clearly regarding the apparently unpleasant nature of the problem about which he is distressed.

The sole object of the interviews is to get at the grievances the recent recruits seem to be confronted with. The vast majority of these grievances the department may rest assured will be found to be of a fictitious nature, based upon phantasy and motivated by unconscious unfulfilled wishes, and *not* due to actual food, living or disciplinary conditions.

When—and herein lies the analyst's capacity to cure—when the fantastic nature of the grievance can be made clear to a lad, when it can be shown him in a quiet and kindly manner that his grievance is based upon imagination and not upon reality, the lad of average intelligence can be counted upon to abandon the grievance, thereby converting discontent into contentedness.

When it can be shown the lad that in reality there looms before him in the military or naval life a career unsurpassed in the world for success, pleasure, health and happiness, many of his feelings of discontent will fade away, and in the place of discontent, with its tendency to grow and terminate in desertion, there will be substituted a healthy viewpoint of the reality of the situation, which will be expressed by him in the resolve to "stick to the ship."

This will mean fewer desertions, less money lost to the administration, and each desertion averted is a definite withdrawal from the community of a potential criminal.

EDITORIAL

NEW APPOINTMENT AND PROMOTION POLICY FOR THE MEDICAL DEPARTMENT RESERVES

Elsewhere in this issue we publish the new policy governing appointment and promotion in the Medical Sections of the Officers' Reserve Corps of the Army.

The Surgeon General of the Army believes these regulations to be a distinct advance in dealing with the reservist and one which will be welcomed by the Medical Profession of America.

A study of these new rules shows that the Medical Department of the Army has adopted a most liberal and progressive policy in dealing with the reservist. The distinct feature of the new promotion scheme as we see it is that eligibility for promotion is based entirely on length of service. This establishes a system which is fair to all and understandable by all. It does away with the controversy and misunderstanding which arose under the complicated rules formerly in vogue and should win the enthusiastic support of the profession. Another distinct advance is the waiving of mental examination for promotion in all grades except promotion to the grade of Lieutenant Colonel which is evidently chosen as a point of demarcation between the medical practitioner and the higher administrative officer in the Medical Department in war. Even for this grade the new policy recognizes four special fields of endeavor and undertakes to adapt the examination to the field of the candidate.

There is no new need in this journal to stress the need of a Medical Reserve, but we take this opportunity to say that the Regular Army Medical Department cannot form a reserve without the cooperation of the medical profession of America, whose responsibility is a joint one. The present liberal policy of the War Department in dealing with the medical reservist should receive the recognition and support of the profession.

COMMENT AND CRITICISM

POLICY GOVERNING APPOINTMENT AND PROMOTION IN THE OFFICERS' RESERVE CORPS IN SECTIONS OF THE MEDICAL DEPARTMENT OF THE ARMY

1. The circular letter dated June 2, 1922 (A.G. 210.2 ORC; 5–20–22 Res.), on subject: Policy regarding promotion of the Medical Department Reserve Officers, and any other previous instructions in conflict herewith are hereby revoked and the following is substituted therefor, under subject shown above. Pending the issue of revised regulations for the Officers' Reserve Corps, the following will govern for the Medical Department:

APPOINTMENT

I. Of Persons without Prior Commissioned Service

1. Original appointments in the Medical, Dental, and Veterinary Sections of the Officers' Reserve Corps will be made in the lowest grade without examination of:

(*a*) Graduates of medical, dental and veterinary schools who have completed successfully the R. O. T. C. courses and who have been recommended by the Professor of Military Science and Tactics.

(*b*) Graduates of recognized medical, dental and veterinary schools who have passed the national or state board examinations necessary to qualify them to practice medicine or surgery.

2. Original appointment in the Medical Administrative and Sanitary Sections of the Officers' Reserve Corps may be made as follows:

(*a*) *Second Lieutenants.*—Applicants under thirty-one years of age who have had more than two and less than five years' experience in the Army or in civil life in duties analogous to the medical service of the Army.

(*b*) *First Lieutenants.*—(1) Applicants under thirty-one years of age who have had more than five years and less than ten years' experience in the Army or in civil life in duties analogous to the Medical Service of the Army.

(2) Applicants over thirty-one years of age who have had more than two years' experience in the Army or in civil life in duties analogous to the Medical Service of the Army.

(*c*) *Captains.*—(1) Applicants who have had more than ten years' experience in the Army or in civil life in duties analogous to the Medical Service of the Army.

(2) Applicants over thirty-six years of age who have had more than five years' experience in the Army or in civil life in duties analogous to the Medical Service of the Army.

3. Original appointments in all sections of the Medical Department in higher grades may be made in the grades which their records of professional attainments warrant in cases of:

(*a*) Those who have a record of service during the World War which, while not in the military establishment, contributed to the successful prosecution of the war, such as service on the Council of National Defense, long service as an examiner of officer candidates or men of the draft, as members of draft or advisory boards, former officers of the Navy and Allied Armies, and

(*b*) Those of eminent general or special qualifications barred from appointment during the World War by circumstances connected with the maintenance of essential public institutions such as, service as essential teachers, public health and other public administrative officers. Candidates falling under the above exceptional circumstances may be appointed in a grade commensurate with their age and standing in civil life.

II. Of Former Officers

The following requirements determine the grade for which former officers are eligible for appointment:

1. *Second Lieutenants.*—Those officers who served satisfactorily on active duty as Second Lieutenant for less than six months.

2. *First Lieutenants.*—(*a*) Those officers who served satisfactorily on active duty in the grade of Second Lieutenant for more than six months.

(*b*) Those officers under thirty-one years of age who served satisfactorily on active duty in the grade of First Lieutenant for less than six months.

3. *Captains.*—(*a*) Those officers who served satisfactorily on active duty in the grade of First Lieutenant for more than six months.

(*b*) Those officers over thirty-one years of age who served satisfactorily on active duty in the grade of First Lieutenant for less than six months.

(*c*) Those officers who served satisfactorily on active duty in the grade of Captain for less than six months.

4. *Majors.*—(*a*) Those officers who served satisfactorily on active duty for at least one year, held the grade of Captain for at least three months, and whose records indicate that they possess the necessary qualifications for field grade.

(*b*) Those officers not otherwise provided for, holding the grade of Major at time of discharge.

5. *Lieutenant Colonels.*—(*a*) Those officers who served satisfactorily on active duty for at least one year, held the grade of Major for at least three months, and whose records indicate that they possess the necessary qualifications for the higher grade.

(*b*) Those officers not otherwise provided for, holding the grade of Lieutenant Colonel at time of discharge.

6. *Colonels.*—(*a*) Those officers who served satisfactorily on active duty for at least one year, held the grade of Lieutenant Colonel for at least six months, and whose records indicate that they possess the necessary qualifications for the higher grade.

(*b*) Those officers who served satisfactorily on active duty in the grade of Colonel.

PROMOTION

III. For the Medical and Dental Officers' Reserve Corps

1. To the grade of Captain upon completion of five years in the grade of First Lieutenant.

To the grade of Major upon completion of five years as Captain.

To the grade of Lieutenant Colonel upon completion of five years as Major.

To the grade of Colonel upon completion of five years as Lieutenant Colonel.

2. For the Veterinary and Sanitary Officers' Reserve Corps:

To the grade of First Lieutenant upon completion of three years as Second Lieutenant.

To the grade of Captain upon completion of three years as First Lieutenant.

To the grade of Major upon completion of five years as Captain.

To the grade of Lieutenant Colonel upon completion of five years as Major.

To the grade of Colonel upon completion of five years as Lieutenant Colonel.

3. For the Medical Administrative Officers' Reserve Corps:

To the grade of First Lieutenant upon completion of five years as Second Lieutenant.

To the grade of Captain upon completion of five years as First Lieutenant.

IV. General Instructions

1. The time necessary for promotion will be counted from date of appointment as regards current appointment. Commissioned service in grade from which promotion is sought, or any higher grade, prior to current appointment, will be computed and credited as provided for in Par. 150, S.R. 43, W.D., 1921. In computing inactive service in ORC prior to current appointment, credit will be given only from date of acceptance.

2. For promotion to the grade of Lieutenant Colonel, the examination, the scope of which will be prescribed by the Surgeon General, shall be such as to demonstrate the applicant's capacity to perform the duties and assume the responsibilities of the grade and class of service sought. A copy of the prescribed examination is inclosed.

3. For all other grades, no examination other than physical will be required when in the opinion of the Board the civil or military experience of the candidate justifies belief in his qualifications for the grade and class of service sought.

4. It will be noted that a Reserve officer covered in these instructions, if he has had no commissioned service in his present or any higher grade prior to his current appointment, will become eligible for promotion on the day his current appointment expires, except for promotion to first lieutenant and captain in the Veterinary Officers' Reserve Corps and Sanitary Officers' Reserve Corps. In order to avoid a duplication of work it is desired that Reserve officers covered in these instructions be examined within a reasonable time prior to the date upon which they

become eligible for promotion and that the board report, with the Corps Area or Department Commander's recommendation be transmitted to this office so as to reach here prior to the date on which the officer becomes eligible for promotion. In that class of cases where the Reserve officer becomes eligible for promotion on the day his current appointment expires it is desired that the board report and recommendation be forwarded so as to reach this office 45 days before the date of expiration of current commission.

By order of the Secretary of War:

ROBERT C. DAVIS,
The Adjutant General.

SCOPE OF EXAMINATION FOR PROMOTION TO LIEUTENANT COLONEL—ALL SECTIONS—MEDICAL DEPARTMENT RESERVE CORPS

I. FOR ALL APPLICANTS

1. Organization and major functions of—
   (*a*) Army of the United States.
   (*b*) Component units of the combined arms.
   (*c*) Medical Department units of the Army.
2. Principles of military discipline and military command.

II. FOR COMMAND—ADMINISTRATIVE

1. Organization and technique of operation of divisional units of the Medical Department.
2. Hygiene and sanitation of large commands.
3. Scheme of military hospitalization—
   (*a*) Divisional.
   (*b*) Communication Zone.
4. Scheme of military evacuation—
   (*a*) Divisional.
   (*b*) Corps.
   (*c*) Army.
5. Solution of a problem involving knowledge of administration of major Medical Department units in war.

III. FOR SANITATION

1. Organization and technique of operation of divisional units of the Medical Department.
2. Hygiene and Sanitation of large commands.
3. Solution of a problem involving application of the knowledge of the special field of sanitation of applicant to a major problem of Army sanitation under war conditions.

IV. FOR SUPPLY—ADMINISTRATIVE

1. Scheme of military hospitalization—
   (*a*) Divisional.
   (*b*) Communication Zone.
2. Scheme of military evacuation—
   (*a*) Divisional.

(*b*) Corps.
(*c*) Army.

3. Solution of a problem involving knowledge of principles of procurement, storage and issue of Medical Department supplies for major military situation.

V. For Professional or Technical Services including consultants, chiefs of professional services and other officers whose functions are chiefly in a professional or technical non-military relation.

1. Scheme of military hospitalization—
   (*a*) Divisional.
   (*b*) Communication Zone.
2. Scheme of military evacuation—
   (*a*) Divisional.
   (*b*) Corps.
   (*c*) Army.
3. Solution of a problem pertaining to the special service in which the candidate is technically qualified.

All applicants will be examined in Section I and in the additional subjects of one of the Sections II, III, IV or V which particularly applies to the special duties for which the applicant is intended in a military unit.

Since this is the only examination required for promotion to higher grades in the Medical Department Reserve, it is intended that it shall be searching and exhaustive with the view to conclusively demonstrating the capacity of the officer to act *independently* in the organization and operation of units for which the grade and specific duty calls.

REPRINTS FOR LIBRARY, ARMY MEDICAL SCHOOL

It is planned to establish at the Army Medical School a complete file of all publications of a scientific nature concerning work performed at the Army Medical School, or in any way connected with that institution, since it was founded in 1893. All medical officers who have published, or who have collaborated in the publication, of such an article are requested to forward a reprint or a copy of the publication containing the article, or, if neither of these is available, a reference to the publication in question, to the Commandant, Army Medical School, Army Medical Center, Washington, D. C. In the future, a reprint of all articles pertaining in any way to the Army Medical School will be forwarded to the Commandant, Army Medical School, Army Medical Center, Washington, D. C., for file.

FRENCH DOCTORS ADMIRE COLLEAGUES IN AMERICA

The following is extracted from the *New York Herald* of recent date, regarding the opinion of the two French colleagues who were with us at the Carlisle meeting:

(*Special to the Herald*)

HAVRE, Thursday.—An exceedingly high opinion of the ability of American Army doctors, particularly in regard to hygiene and practical sanitary organization, has been carried back to France by Dr. F. Duguet, professor at the Val de Grace, army hospital of Paris, and Dr. Fernand Visbecq, who arrived at Havre in the liner *France* yesterday, after attending the American Army Surgeons' Association Congress at Carlisle, Pa. Accompanying them on the return trip was Professor Porcher, one of the greatest European authorities on milk, who was a delegate to the International Dairies' Association at Seattle, Wash.

The French physicians waxed enthusiastic about the reception accorded them at Carlisle. "We were carried off our feet to the homes of American officers and treated like blood relatives," they said.

Professor Porcher declared that America has the best milk in the world.

ANNOUNCEMENT OF REMOVAL

The many medical friends of Burroughs Wellcome & Co. will be interested in the removal of this well-known firm's New York establishment to their new building at 9 and 11 East Forty-first Street. This building, which is a modern steel-framed, fire-proofed twelve-story structure, is of pure Gothic style. Handsome and attractive in appearance, its distinctive character makes it a pleasing and conspicuous addition to the notable buildings in its vicinity.

Located opposite the Public Library, just off Fifth Avenue, in the very heart of the most central business district of the city, this new building is easily accessible from every quarter.

A cordial invitation is extended to the medical profession by Messrs. Burroughs Wellcome & Co. to visit their new exhibition rooms at any time to inspect the display of fine chemicals, galenicals and other products for which the firm has been so long and favorably known.

The researches and experimental investigations carried on so many years by the firm through its laboratories and scientific departments have led to the accumulation of a wealth of special and unique information which is freely available at all times to medical men and scientific workers in general.

The work of Messrs. Burroughs Wellcome & Co. in connection with particular lines of investigation, such as the preparation of portable medical outfits, designed to save space for military, exploring, hunting and other expeditions and withstand the trying climatic and atmospheric conditions, has developed a wide variety of equipment, which will always be found at the service of those interested.

ASSOCIATION NOTES

Major Edmund B. Spaeth, M. C., U. S. Army, now on temporary duty in Vienna, from the Walter Reed General Hospital, has been elected president of the American Medical Association of Vienna. This is not only an honor to Major Spaeth but also to the service which he represents. Naturally it is not often that army medical officers are on duty in Vienna, and that Major Spaeth was selected for this office is noteworthy. The American Medical Association of Vienna is a well-known organization for the systematic promotion of international post-graduate study and before the war was very strong. We believe that under Major Spaeth's direction it will regain its former prestige.

Col. A. C. Christie, formerly an officer of the Medical Corps, of the Regular Army, has been appointed Editor of the *American Journal of Roentgenology and Radium Therapy,* the official organ of the American Roentgen Ray Society and the American Radium Society. The first number under Colonel Christie's direction will appear in January, 1924.

BOOK REVIEWS

THE MEDICAL DEPARTMENT OF THE UNITED STATES ARMY IN THE WORLD WAR. Volume I. The Surgeon General's Office, War Department, 1923, Washington, D. C.: Government Printing Office.

This is the first of a large number of volumes to be published on the administrative and professional work of the Medical Department of the United States Army in the World War. As the Surgeon General's Office was the center from which radiated both administrative and professional activities, this volume in a sense serves as an introduction to the history as a whole.

This history is an official publication for which the funds are provided by the Congress of the United States, to be expended under the direction of the Secretary of War. The Surgeon General distributes the history to libraries. Copies may be purchased from the Superintendent of Public Documents, Government Printing Office, Washington, D. C. The price of the present volume is $3.00.

The Historical Division of the Surgeon General's Office, consisting of an editor-in-chief, an assistant editor-in-chief, a few Medical Department officers specially detailed to the work, and a small clerical force, is directly responsible for the publication of the history. An editorial board, consisting of regular and reserve officers of the Medical Department, acts in an advisory capacity. The material for all volumes not actually compiled by members of the Historical Division, consists of voluntary contributions from World War Medical Department officers, most of whom are now no longer on active duty, though many are in the reserve.

The editorial board for the history is constituted as follows:

Col. Charles Lynch, M.C., Editor-in-Chief; Dr. Loy McAfee, C.S., Assistant Editor-in-Chief; Col. Bailey K. Ashford, M.C.; Col. Frank Billings, M.C.; Col. Thomas R. Boggs, M.C.; Col. George E. Brewer, M.C.; Col. W. P. Chamberlain, M.C.; Col. C. F. Craig, M.C.; Col. Haven Emerson, M.C.; Brig. Gen. John M. T. Finney, M.D.; Col. J. H. Ford, M.C.; Lieut. Col. Fielding H. Garrison, M.C.; Col. H. L. Gilchrist, M.C.; Brig. Gen. Jefferson Kean, M.D.; Lieut. Col. A. G. Love, M.C.; Col. James F. McKernon, M.C.; Col. S. J. Morris, M.C.; Col. C. F. Morse, M.C.; Col. R. T. Oliver, D.C.; Col. Charles R. Reynolds, M.C.; Col. Thomas W. Salmon, M.C.; Lieut. Col. G. E. De Schweinitz, M.C.; Col. J. F. Siler, M.C.; Brig. Gen. W. S. Thayer, M.D.; Col. A. D. Tuttle, M.C.; Col. F. W. Weed, M.C.; Col. William H. Welch, M.C.; Col. E. P. Wolfe, M.C.; Lieut. Col. Casey A. Wood, M.C.; Col. Hans Zinsser, M.C.

The editors of the volume under discussion are Col. Charles Lynch, M.C., Lieut. Col. F. W. Weed, M.C., and Loy McAfee, A.M., M.D. Originally, Lieut. Col. Fielding H. Garrison, M.C., and Lieut. Col. Casey A. Wood, M.C., were charged with the duty of editing the volume in question, on which both worked for some time, but the exigencies of the service separated them from all contact therewith before the book took final form.

The book is a royal octavo of 1,389 pages, including the index, bound in a maroon buckram—the Medical Department color. Coated paper has been used, presumably on account of its superiority for illustrations. Unfor-

tunately, however, the printer did not match the paper in color, so, as this volume appears, part of the pages are of a cream tint and part a dead white. We cannot call to mind any book of like importance in which such a flagrant mistake in printing has been made.

The contents, however, are in marked contrast to the dress in which the book appears, being highly creditable to all concerned. The volume begins with a letter of transmission from the Surgeon General to the Secretary of War; then appears a list of the officers constituting the editorial board, followed by the preface and introduction. The body of the book is divided into sections as follows: Section 1, Relationships of the Medical Department within the War Department. Section 2, Organization and Administration, with seventeen chapters describing the various divisions of the Surgeon General's Office. Section 3 has to do with organizations which rendered voluntary aid. An appendix in three parts follows, and an excellent index of the whole book. Both plates and charts illustrate the text. Among the former will be found excellent pictures of the late Surgeon General, W. C. Gorgas, and of the present Surgeon General, Merritte W. Ireland.

In his letter of transmission General Ireland states briefly the status of the Medical Department at the beginning of our participation in the war. Otherwise, the letter in question is a hearty tribute to the Medical Department of the Army and to the various volunteer agencies affiliated with it, which, together, did so much to aid in waging a successful war and in tenderly caring for the disabled from the firing line to the last of the long chain of great hospitals in our own country.

The preface gives certain pertinent facts in respect to the present history and to former medical war histories, especially to our own previous effort in this direction, the medical and surgical history of the Civil War.

The first part of the general introduction describes the evolution of the Medical Department up to the time of the recent war; the second gives an account of the development of Red Cross Medical Department units. The former is by the editor-in-chief, Col. Charles Lynch, M.C., and the latter by Brig. Gen. J. R. Kean, M.D. It is doubtful if any other officers could speak with such intimate knowledge on these two subjects. Colonel Lynch, as assistant to Surgeon General O'Reilly and to Surgeon General Torney, and as a member of the General Staff, was directly responsible for working out the details of what proved to be our Medical Department organization when we entered the World War. General Kean actually organized the Department of Military Relief of the Red Cross and was its first director general. The plan followed throughout, as stated in the preface, was to select the officer best qualified to write on each subject. Each division of the Surgeon General's Office is described by the officer in charge, or when, as was sometimes the case, this proved impossible, by some other officer connected with the particular division who had intimate knowledge of its operation.

Section I, by Lieut. Col. Frank W. Weed, M.C., makes clear the exact place of the Medical Department in the military hierarchy.

It should be noted in connection with the descriptions of the various divisions of the Surgeon General's Office (Section II) that the names of the officer personnel in each case appear at the end of the story of the division.

In Section III, due credit is given the various national voluntary aid agencies of the war. This section, though necessarily brief, in view of the

great demand for space, brings out the main facts having to do with the association with the Medical Department of the Army, of the American National Red Cross, the Red Star American Relief, the Committee on Medicine, Council of National Defense, the National Research Council, the American Medical Association, and the Commission of Training Camp Activities, including the Young Men's Christian Association, the Knights of Columbus, the Jewish Welfare Board, the American Library Association, the Salvation Army, the War Camp Community Service, and the Young Women's Christian Association. Many of the organizations in question have published elaborate reports of their own, and of course the only purpose here is to link them up with the Army, leaving to the reports in question descriptions of the more intimate details concerning the activities of the associations themselves.

The names of 540 officers of the Medical Department who lost their lives in the service of their country during the war appear under the head of In Memoriam in the appendix. The last section of this appendix comprises the orders, bulletins, circulars and special regulations published by the War Department, which affected the Medical Department, and war promulgations of the latter department itself. Doubtless in the time to come this section will prove one of the most valuable parts of the book. It is understood that already it is being extensively used in the course of instruction at the Field Service School for Medical Officers at Carlisle Barracks, Pa.

In accordance with modern practice, this is a documented history. As the War Department rule on the subject of documentation is that every material statement of fact must be supported by documentary evidence, it can easily be seen what a monumental task confronts the editors. Mention has already been made that, so far as the present volume is concerned, and doubtless this will also be the practice throughout the history, the officer selected to write each section was one intimately acquainted with the subject during the war. This plan would seem to be scarcely less valuable to insure correctness than that of documentation. Histories of the past must rely solely on documents, it is true, but contemporary history should not fail to take advantage of the intimate personal knowledge of the participants, for this will be forever lost within a very brief period.

Unquestionably, many readers of the present review have profited by study of the British Official History of the War, Med. Col. Services, so far as this has been published, and Major Gen. Sir W. G. MacPherson as editor is certainly to be congratulated on his promptness in having already printed so many volumes. Apparently, so far as central administration is concerned, the British history will differ widely from the present one both in plan and scope. It is personal, while this is impersonal; it is not documented, while this is; and great detail with them was apparently sacrificed to promptness in publication, while the present volume takes up every important subject at great length. We have, of course, no knowledge of what will best meet the need of the British and, moreover, it is quite apparent that their plan has certain advantages over ours. The narrative is easier to read, and early publication is insured. On the other hand, it does not seem to us that the medical administrators of the future will find in the British history the details which will enable them to go ahead where their predecessors left off. Not only does the present history go into far more detail than does the British history, but in this respect it goes much further than does any similar history ever published.

Notwithstanding the monumental character of our Civil War medical history one searches in vain for any hint of how the central administration of the Medical Department carried on its vast work. With the present volume in hand, no one will be at a loss in this respect in the future.

THE MEDICAL DEPARTMENT OF THE UNITED STATES ARMY IN THE WORLD WAR. VOLUME V, MILITARY HOSPITALS IN THE UNITED STATES; War Department, 1923, Government Printing Office, Washington.

This is the second of the administrative volumes of the Medical Department of the United States Army in the World War to appear. Like Volume I, the review of which appears above, it is a royal octavo, bound in maroon buckram. It contains 857 pages including the index, and was prepared for publication by Lieut. Col. F. W. Weed, M. C.

As outlined in the preface of the volume its purpose is twofold: To make of record experiences incident to the procurement and the operation of military hospitals in the United States during the World War, and to give in as great detail as is practicable, separate histories of the military hospitals to perpetuate their identities.

In the introduction a brief outline of the evolution of military hospitals is given. Sections I, II, and III describe methods of procurement, construction, organization, administration, and control of military hospitals. The remaining sections have to do with the histories of the various hospitals arranged according to particular types. Thus the first hospital considered is the base hospital at Camp Grant, Ill. Its history, humanly told, is very replete with details that will prove of great value to commanding officers of similar war hospitals in the future. Then follow, in greater or less detail, the histories of a permanent general hospital, that of Walter Reed General Hospital at Washington, and of the temporary general hospitals at Fort McHenry, Baltimore, Md., Denver, Colo., and Colonia, N. J., and of hospitals at the ports. Subsequent chapters give brief histories of hospitals not considered in detail.

An interesting chapter is one which describes the airplane ambulance. This chapter includes a survey of the efforts of our Army to transport wounded by airplane from the earliest attempts by Gosman and Thoades in 1910 to the remodeled DH-4 of 1918.

Many tables of great value appear in the book. The most striking of these are the tables showing schedules of the various kinds of hospitals provided, together with the rated capacity of each. There are tables on available beds, and tables showing the number and distribution of overseas patients. However, the tables which appear in connection with the history of each hospital, and which show just what each had to do in the way of caring for patients as well as what personnel they had, will prove of greatest value in the future when questions might arise concerning the allowance of Medical Department personnel for hospitals.

The volume as a whole has a pleasing appearance. It has 204 illustrations which are excellent.

SEMIOLOGIE OCULAIRE, LA CALLOTTE CORNEO-SCLERALE (anatomy, physiology, and pathology), 260 pages with 144 illustrations, by Dr. Felix Terrien, Professor of Ophthalmology, Faculty of Medicine, Paris and Ophthalmologist to 17 Hopital Beaujon. Publishers: Masson and Cie, Paris, from the library of the Academy of Medicine, Paris.

This is a book, the first of its kind that has come to the attention of the reviewer, covering this rather highly specialized branch of ophthalmology. It includes the anatomy, pathology, physiology, diagnosis and treatment of the diseases of the anterior segment of the eyeball. Particular attention is paid to the ophthalmological relationships of this portion of the eye to medicine in general. The volume also is enriched through the experiences of the author during the World War.

The book is divided into two main parts, both of them being preceded by a detailed section on the generalities of the subject under question; i.e., the embryology, the anatomy, the physiology, the morphology, and the symptomatology, etc., of the entire anterior cup of the eyeball. This includes the cornea and sclera, the anterior chamber, iris and region of the ciliary body, the posterior chamber and the crystalline lens with its suspensory apparatus.

The first and second portions of Part One consider the microscopic and macroscopic structure of the cornea, including the structures closely connected with it as its circulation and nerve supply, the histology of the limbus, the considerations of Schlemm's canal, etc.

The third subsection discusses the physiology of the anterior segment of the eye, its rôle as a natural protector, its cicatrization, causes influences influencing the region of the cornea, and the metabolism, with clinical deductions. This same section discusses the aqueous and its physiology and functions.

Subsection four has to do with the clinical examination of the cornea, (1) by diffused light, discussing form and contour, dimensions, transparency and sensitiveness; (2) examination by concentrated light; (3) the employment of dyes; (4) the use of the ophthalmoscope; (5) the use of the corneal microscope and the slit lamp (this includes the examination of the conjunctiva as well; (6) transillumiuation from a normal and pathological state.

Part Two of the book considers in most unusual detail the diseases of the anterior segment of the eye.

The first subsection of Part Two discusses the superficial, the deep and the interstitial infiltrations.

The second subsection treats of ulcerations subdivided as follows: (*a*) the epithelial; (*b*) the suppurative forms; (*c*) the trophic disturbances; (*d*) the connection the cornea has with general medical conditions.

The third subsection treats of healing or cicatrization with its peculiar complications.

Part Two of the second major subdivision of the book is given over to a consideration of the diseases of the sclera, according to its generally accepted classification; diseases of the conjunctiva in like manner; and the results of traumations to the eye. This part also includes a short portion upon neoplasms of the anterior segment of the eye, and a chapter upon the functional incapacity of the eye, following injuries to the globe as well as an estimation of the resulting visual impairments. The illustrations included are a all well selected and valuable. Probably the most valuable portion of this book is the ophthalmological relationships the author has shown as existant in ocular symptomatology with general medical conditions.

EDMUND B. SPAETH.

OPHTHALMIC SURGERY—A Handbook of the Surgical Operation on the Eyeball and its Appendages as Practised at the I. Eye Clinic, University of Vienna, by Dr. Josef Meller, Clinical Professor of Ophthalmology, I. Eye Clinic, University of Vienna. Edited by Dr. William M. Sweet, Clinical Professor of Ophthalmology, Jefferson Medical College. Third edition. Translated from the second edition, "*Augenarzliche Eingriffe*" (*Josef*

Safar, Vienna). With 219 original illustrations. Philadelphia: P. Blakiston's Son & Co.

In his preface the author stresses the necessity of a competent instructor in the art of operating on the human eye. He declares that even one who is exceptionally balanced for any art cannot attain the highest proficiency and become a master of that art if the teacher is wanting, and in this we must agree.

We are also in accord when he says that he who after the first few cases of eye operations fails to carry out his work successfully should withdraw his hand from this work forever. In no other branch of surgery is the same exactions of manipulation required, nor the result of small deviation from perfection in technique followed by such dire consequences. The slightest misplacement of an incision, the deviation of the knife from its true course, undue pressure upon the open globe or pressure wrongly applied, timidity and nervousness of the operator himself, these and innumerable details, in themselves apparently trivial in character, may be fatal to the successful issue of the operation.

The book does not pretend to be a compendium of all eye operations. The author has rather selected those which have in his own hands proven of most value, and these he has set forth in detail for the guidance of the student.

The contents of the book are as follows:

The Lachrymal Apparatus.
The Lachrymal Apparatus (continued).
Spasmodic and Senile Ectropion.
Cicatricial Ectropion.
Entropion and Trichiasis.
Canthotomy—Canthoplasty—Tarsorrphphy.
Ptosis.
Operations on the Ocular Muscles.
Enucleation of the Eyeball. Operations on the Orbit.
Extraction of Senile Cataract.
Cataract.
Operations for Glaucoma.
Optical Iridectomy—Conjunctivoplasty—Operations for Iris Prolapse and Anterior Synechia.
Operations on the Cornea—Operations for Retinal Detachment and Vitreous Opacities.
Extraction of Foreign Bodies from the Interior of the Eye.
Minor Ophthalmic Operations.

To those familiar with former editions many of the cuts, which are excellent, will be recognized, but there are many new ones.

Among the new matter is a description of enucleation under local anesthesia, which in the Vienna Clinic is employed in all cases except difficult ones in which the globe is crushed or inflamed or there is injury to the orbital tissues. He asserts that evisceration with insertion of a globe in the sclera (Mules operation) is not practiced in the Vienna Clinic because of danger of sympathetic inflammation following its use and the liability of extrusion of the ball even after some time has elapsed. In this country the Mules operation has been quite extensively employed by some of our best operators and in the hands of the writer has been unattended by any

untoward consequences. Certain it is that the most useful stump is thus obtainable. Proper selection of cases, the use of a globe ball only and careful technique are essential to successful results. One would hesitate to employ the procedure in cases "in eyes painful and blind from glaucoma," one of the indications mentioned by the author, or in any eye in which existed a severe inflammation of the uveal tract.

Enucleation with implantation of cartilege in Tenon's Capsule as advocated in Magitot is mentioned, but the author does not recite his own experience with the method, which is it is proven successful, is a step forward.

It is of interest to observe that in the consideration of cataract the intracapsular operation is not mentioned. Evidently it does not meet with the approval of the author.

One cannot agree with the author that "every prolapse of the iris, if not too large, should be excised." Surely in many instances of recent incised wounds with iris prolapse replacement combined with the use of a conjunctival flap will give satisfactory results. The author recommends the use of the conjunctival flap, in perforating ulcer of the cornea with prolapse of the iris, following iridectomy, and also in corneal injuries and in scleral wounds.

The arrangement and clearness of the subject matter are excellent. Both illustrations and print leave nothing to be desired.

T. E. Obtel.

The Heart—Its Physiology, Pathology, and Clinical Aspects, by Selian Neuhof, M.D., Visiting Physician, Central and Neurological Hospital, Consulting Cardiologist, Broad Street Hospital, New York City. 8vo, xii + 701 pp. Philadelphia: P. Blakiston's Son & Co., 1923. Price, cloth, $10.

It is the aim of the author to present the entire subject of cardiac and cardiovascular disturbances and diseases in a clear and well-balanced manner from the clinician's viewpoint. It can be used by the practitioner and student as well as those who are specially interested in this subject.

The contents are divided into two parts. The first considers the cardiovascular system from embryology to treatment in a concise and thorough manner and is separated into thirty-three chapters. The newer point of view of the cardiac functions in terms of respiration, blood oxigenation, and blood chemistry have been considered.

The selection of proper medication in heart disturbances and diseases is as important, or more so, than is the diagnosis. The author covers this phase in the paragraphs on the various individual disturbances and also devotes a general chapter on treatment.

Chapter XXIX, which treats of the cardiovascular examination of the war recruit, is of special interest to the military surgeon. The chapter on "Rôle of the Heart in Life Insurance" should be read by both the military surgeons for aid in the yearly examination of the officers and by the practitioner who examines for the life insurance companies.

Precordial pains of extra-cordial origin should be studied carefully for

differential diagnosis purposes, in order to relieve the minds of the patients who imagine that they have serious heart trouble.

Part 2 is composed of case histories from a cardiovascular clinic and has been used in teaching senior students. This is a new departure in textbooks and tends to make the text more interesting and instructive. One hundred and eight cases were selected to cover all the phases of cardiovascular diseases. The discussions given in these cases help to clear points which are apt to appear cloudy to us.

There are 300 illustrations, many of which are electrocardiograms. Although the author believes that the clinical value of the lessons learned from graphic curves is often less than that obtained from the older non-instrumental methods, he insists that the student should first master the basic principles underlying them before trying to make a correct diagnosis without their aid.

Finally, a good textbook should have an extensive index for reference work. Thirty-one pages are taken up by this index, which makes it easy for one to find the location of the subject matter.

W. S. Dow.

Typhus Fever, with special reference to the Russian epidemics: by J. M. Mitchell O.B.E., M.B., Ch.B. Aberdeen, Captain, L.M.S.; Late Officer Commanding British Mission Hospital, South Russia; I. N. Asheshov, M.B., Ch.B. Saratov, in charge of Government Bacteriological Laboratory, Ragusa, Yougoslavia, late bacteriologist attached to British Mission Hospital, South Russia; and G. P. N. Richardson, M.B., B.Ch. Camb., late medical officer attached to British Mission to South Russia. 8°, 48 pages. London, Bailliere, Tindall and Cox, 8, Henrietta Street, Covent Garden, 1922. Price, 3/6.

This little book gives a very satisfactory description of an epidemic of typhus fever, by medical officers who faced the problem of combatting the disease as it existed in the Volunteer Army of South Russia under General Denekin. The general preventive measures are described and there is a good discussion of the treatment of the disease. The last chapter is devoted to preventive inoculation by the use of serum from patients convalescing from the disease, a procedure which seems to have been very effective although its use has thus far not been extensive. The work is interesting and of value but it is surprising that even a brief work on this disease should have omitted entirely any account of the Rickettsia bodies.

Edgar Erskine Hume.

Medical Ethnology, by Chas. E. Woodruff, A.M., M.D., Author of "The Effects of Tropical Light on White Men" and "Expansion of Races"; Associate Editor of "American Medicine"; Lieutenant Colonel, U. S. Army, Retired; Member American Therapeutic Association; Fellow Medical Association of the Greater City of New York; Member American Association for the Advancement of Science. 8°, 321+ xi pp. New York: Rebman Co., 141 West 36th Street, 1915.

This work is the outgrowth of the former volume entitled, "Effects of Tropical Light on White Men." Its title and scope were changed in view of the many other factors than pigmentation which enter into racial difficulties. The volume contains a consideration of the evolution and the general racial physical characters together with a discussion of migration and race distribution. The bulk of the work consists of a discussion of ether

waves and their action on protoplasm, the effects of infra-red and the ultra-violet rays, radium and high frequency waves, the result of insufficient pigmentation. The nervous and eye diseases due to light are dealt with at length. The work is a valuable reference for practitioners of tropical medicine and particularly those medical officers serving with white troops in the tropics.

EDGAR ERSKINE HUME.

PRACTICAL DIETETICS, with reference to Diet in Health and Disease, by Alida Frances Patee, graduate, Department of Household Arts, State Normal School, Framingham, Mass.; Former Instructor in Dietetics, Bellevue Hospital, New York City. Former Instructor at Mount Sinai, Hahnemann, and the Flower Hospital Training Schools for Nurses, New York City; Lakeside, St. Mary's Trinity, and Wisconsin Training Schools for Nurses, Milwaukee, Wis.; St. Joseph's Hospital, Chicago, Ill.; St. Vincent de Paul Hospital, Brockville, Ontario, Canada. Fourteenth edition, 8°, 646 pp. New York: A. F. Pattee, 1923. Price, $2.60.

This book is a discussion of the general subject of dietetics, considering not only the scientific principles of food values, food sanitation, methods of cooking, etc., but also a detailed account of the individual elements of a well-balanced diet. The second half of the book is on dieto-therapy describing the diets necessary in the several diseased states. An appendix is devoted to diets in pregnancy, infant feeding and the diets for old age. The volume is accompanied by a small leaflet entitled "Teacher's dietetic guide," which contains the state board requirements in dietetics.

EDGAR ERSKINE HUME.

DREADS AND BESETTING FEARS, Including States of Anxiety, Their Causes and Cure; by Tom. A. Williams, M.B., C.M. Boston: Little, Brown & Co., 1923. Price, $1.75.

The Great War threw into high relief a dynamic factor but little stressed in civil life, that is, fear. Regarded by Stanley Hall as the emotion most ubiquitous and intrinsically the most favorable for immortality, it nevertheless was not prominent before the war. Psychiatrists were aware of the existence of a number of fear states and also of the etiological importance of fear in many psychotic and neurotic conditions. This knowledge was immensely increased by the war itself. During that conflict neuropsychiatrists had the opportunity of studying thousands of neuroses and psychoses whose motivating factor was fear—fear of death, of injury, of cowardice, and so on.

The author of this book, Dr. Tom Williams, spent two years on the allied battle-front, studying these conditions. As a result of his observations, together with his many years' experience as a neurologist in civil life, he has published this book on fear states.

His are none of the spectacular methods so much in vogue in certain quarters nowadays, whereby neurotic patients are cured either instantaneously or by some hocus-pocus. Williams says that it does not matter whether the cure takes an hour or two years. The whole question is whether or not it is a *sound cure*. Thus he quotes cases in which in one conversation he has relieved long-standing dreads, and also cases in which, after months of work with the patient, he has only succeeded in partially alleviating the situation.

Dr. Williams is not a psychoanalyst, although, with his usual open-mindedness, he has not hesitated to borrow from that method what he considered of value. His method may be looked upon as a triple one: Psychopathology plus neurology plus common sense. He makes a careful survey of the patient's actual neurological condition. Then he delves into the etiology of the neurosis, applying all his psychopathological knowledge. Lastly, he applies to the whole procedure the saving vision of common sense.

He points out the irrationality of the suggestion methods used so much in the late war whereby paralysis and mutism and other hysterical symptoms were cured at once: these symptoms should be understood by the patients themselves in order to fortify them against relapses.

In short, in this book he has shown how fear is due to ignorance, and how, by enlightening the patient, we may remove the fear. In fact, his text might well be the phrase he quotes several times: "Better a dreadful certainty than an uncertain dread."

JOHN E. LIND, M.D.

MODERN ASPECTS OF THE CIRCULATION IN HEALTH AND DISEASE, by Carl J. Wiggers, M.D., Professor of Physiology in the School of Medicine of Western Reserve University, Cleveland, Ohio. Second edition, illustrated with 204 engravings. 8°, 662 pp. Philadelphia and New York: Lea & Febiger, 1923.

This volume presents the methods by which combined laboratory and clinical study has finally led to the true explanation of many difficult problems. Its earlier chapters (Chapters 1-9, inclusive) deal with the general physiology of the circulation. It goes without saying that the newer methods of investigation, such as the electrocardiogram, phlebogram, etc., are referred to with great frequency and their importance is stressed. Chapters 10 to 19 inclusive are concerned with all the instruments of precision and diagnostic procedures which have been put to use for investigation of the phenomena of blood circulation in man. The discussion of the mechanical principles fundamental to these pieces of apparatus and to the methods employed is a very detailed one. Likewise in this section the author shows clearly how to translate into clinical language the readings and results secured. A third and final section is given up entirely to the diseases of the heart and circulation and the application of all later methods to the diagnosis of these pathological conditions.

The book is well rounded, of very orderly arrangement, excellently illustrated, and contains at the end of each chapter bibliographies calculated to delight the hearts of those who appreciate the value of complete lists of references.

A. N. TASKER.

LABORATORY STUDIES IN TROPICAL MEDICINE, by C. W. Daniels, M.B. (Camb.), F.R.C.P. (Lond.), Late Lecturer on Tropical Diseases at the London Hospital, St. George's Hospital, London School of Medicine for Women; formerly Director of the London School of Tropical Medicine; Director of the Institute for Medical Research, Federated Malay States; Member of the Royal Society Malaria Commission in India and Africa, and in the Medical Service of the Colonies of Fiji and British Guiana; Consulting Physician, Hospital for Tropical Diseases; and H. B. Newham, C.M.G., M.D. (Durh.), M.R.C.P. (Lond.), D.P.H. (Camb.), D.T.M. and H. (Camb.), Director of the Department of Tropical Pathology and Warden of Studies, London School of Tropical Medicine; late Temporary Lieutenant Colonel, Royal Army Medical Corps, and Consultant in Tropical Diseases, East African Forces. Fifth edition, 8°, 576 pp., 7 pl. New York: William Wood & Co., 1923.

This textbook has long been in use by students of tropical medicine, par-

ticularly those of the London School of Tropical Medicine. The fifth edition will be welcomed. The book is an introduction to a study of laboratory technique in connection with tropical medicine and as such is very satisfactory. The work includes instructions as to the use of the microscope and other laboratory apparatus; the conduct of postmortem examinations; the study of normal and abnormal blood; blood protozoa; pigment deposits and degenerations in tissues; intestinal protozoa; protozoa occurring in other tissues; urine; bacteriology (containing not only a consideration of those bacteria producing tropical diseases but also certain general discussions of bacteriological technique in the tropics); measurement of microscopic objects; helminths; examination of feces; entomology. The last is an especially satisfactory section constituting almost a third of the book.

The work will be very useful to the student preparing for examinations in the field of tropical medicine or for a reference when only a few books may be carried. However, the work is too brief to be considered anything like a complete reference work. Taylor's technique for the Wasserman test described on page 112 et sq. is not one of those considered "standard" in Great Britain.

EDGAR ERSKINE HUME.

UN HÔPITAL MILITAIRE À PARIS PENDANT LA GUERRE, Villemin, 1914–1919, by Felix Lejars, Professeur de Clinique Chirurgicale à la Faculté de Médecine de Paris, Ancien Médecin Chef de l'Hôpital Militaire Villemin. 8°, 364 pp. Paris: Masson et Cie, Éditeurs, 1923.

This book is not only an intimate history of the activities of a military hospital in Paris during the great war but also a work that throws interesting light on general conditions in the French capital at that time. The author, who at all times seeks to efface himself, was in charge of this hospital and in his five years of service experienced about all of the difficulties and trials that could fall to the lot of a military hospital commander in war time. His hospital cared for more than 30,000 officers and men with a general mortality of 2.77 per cent. The book is interesting and forms a valuable chapter of the personal side of the military history of the war. Of especial interest are the chapters describing the visits of Gallieni and Clemenceau, the reactions of the personnel during bombardment, the arrivals of great trains of wounded, the measures taken during air attacks, etc. In conclusion the author urges the importance of a "fusion and intimate collaboration" in time of peace of regular and reserve officers in order to better prepare for war.

EDGAR ERSKINE HUME.

MANUEL DE SANITAIRE FRANCAISE, by Dr. H. Violle, Professor of Hygiene in the Marseilles School of Medicine, and Dr. R. Wibaux, Auditor of the Superior Council of Hygiene. Paper bound book, viii, 253 pages. Paris: Masson and Company, 1923. Price, 12 francs.

The authors felt the need of a reference book of this kind for the use of the Inspectors of Hygiene, the Directors of the Bureau of Hygiene, the marine sanitary officers, the sanitary deputies, and the epidemiologists. A text of this kind is naturally one of compilation and arrangement. One therefore expects little of original work. The introduction gives a brief history of

the development of the sanitary laws. The authors acknowledge that the sanitary laws of France are not yet perfect but believe that they are advancing in that direction and that they rank among the best of the European countries.

The book is divided into four parts: first, Administration and Hygiene; second, Protection of the Public Health; third, Sanitary Police of the Frontiers; fourth, Antitubercular Legislation. The different articles of the laws bearing upon these subjects are quoted, giving the number of the article and the date of the law, so that the reader knows the authority. Model rules for sanitation in cities, towns, camps, and rural districts are given for the basis of laws to be passed in these various places. Prophylactic instructions are explained in detail concerning the gastro-intestinal, respiratory, skin, ocular, and genital diseases.

Antitubercular legislation has received a stimulant lately, and the fourth part, consisting of twenty-five pages, has been devoted to this subject. Those sanitary officers, who care to compare our laws on sanitation with those of France, will find this book a handy reference.

Wm. S. Dow.

Clinical Bacteriology and Hematology for Practitioners, by W. D'Este Emery, M.D., B.Sc., London; Director of the Laboratories and Lecturer on Pathology and Bacteriology, King's College Hospital, and Lecturer on General Pathology, London School of Medicine for Women; formerly Hunterian Professor, Royal College of Surgeons. London: H. K. Lewis and Company, Ltd.

This work has successfully gone through six editions. As the title indicates, it is a manual for the general practitioner.

Considerable space is devoted to the interpretation of the results of the various laboratory examinations.

The subject-matter is divided as follows:

Part I. Bacteriology.

Section 1. Apparatus and processes.

Section 2. Diagnosis of certain diseases.

Section 3. Collection and examination of morbid materials.

Part II. Hematology.

Part III. Cytodiagnosis.

Preceding the opening chapter are eleven pages of plates, many of them colored. These are for the most part excellent.

George F. Lull.

657

CONTRIBUTORS

MAJOR L. H. BAUER, M. C., U. S. A.
LIEUT. JAMES D. BENJAMIN, M. C., U. S. N.
COL. GUSTAVUS M. BLECH, M. R. C., U. S. A.
FLORA L. BRADFORD, R. N.
FIRST LIEUT. LEE B. CADY, M. O. R. C., U. S. A.
RUSSELL L. CECIL, M. D.
COL. JAMES ROBB CHURCH, U. S. A., RET.
LIEUT. COL. M. B. CLOPTON, M. O. R. C., U. S. A.
MAJOR A. T. COOPER, M. C., U. S. A.
MAJOR ELLIOTT C. CUTLER, M. O. R. C., U. S. A.
LIEUT. COL. W. R. DAVIS, M. C., U. S. A.
COL. MARIE LOUIS FIRMIN DUGUET, FRENCH ARMY
MAJOR LAWRENCE H. DUNN, S. R. C., U. S. A.
LIEUT. COL. ALBERT P. FRANCINE, M. O. R. C., U. S. A.
SURG. EDWARD FRANCIS, U. S. P. H. S.
COL. JACOB FRANK, ILL. N. G., RET.
LIEUT. COL. FIELDING H. GARRISON, M. C., U. S. A.
LIEUT. COL. H. L. GILCHRIST, M. C., U. S. A.
ADOLPH M. HANSON, M. D.
D. S. LAMB, M. D.
SURG. J. P. LEAKE, U. S. P. H. S.
HOWARD LILIENTHAL, M. D.
SURG. EDWARD R. MARSHALL, U. S. P. H. S.
MAJOR R. McBRAYER, M. O. R. C., U. S. A.
MAJOR N. L. McDIARMID, M. C., U. S. A.
EDWARD L. MERRITT, M. D.
MAJOR H. C. NEBLETT, M. C., U. S. A.
LIEUT. COL. H. WINNETT ORR, M. R. C., U. S. A.
SARAH E. PICKETT, R. N.
CAPT. WM. C. PORTER, M. C., U. S. A.
MAJOR M. A. REASONER, M. C., U. S. A.
LIEUT. COL. E. L. RUFFNER, M. C., U. S. A.
LIEUT. COL. HENRY H. RUTHERFORD, M. C., U. S. A.
MAJOR R. E. SCOTT, M. C., U. S. A.
MAJOR T. E. SCOTT, M. C., U. S. A.
MAJOR NORVELLE W. SHARPE, M. O. R. C., U. S. A.
MAJOR ARTHUR N. TASKER, M. C., U. S. A.
COMDR. J. C. THOMPSON, M. C., U. S. N.
LIEUT. COL. EDWARD B. VEDDER, M. C., U. S. A.
COL. FERNAND M. H. VISBECQ, FRENCH ARMY
MAJOR CYRUS B. WOOD, M. C., U. S. A.

INDEX

Volume LIII, December, 1923

1. Original Articles are indicated by (*).
2. Reprints and Translations by (R. & T.).
3. Editorials by (Ed.).
4. Correspondence by (Cor.).
5. Current Literature by (C. L.).
6. Reviews by (Rev.).
7. Comments and Criticism by (C. & C.)
8. Obituary by (Obit.).
9. Clinical Notes (C. N.).
10. Instruments and Appliances (I. & A.).

A

Air Service Pilots, Chronic Infection of the Teeth and Gums as a Cause of Staleness in. Maj. H. C. Neblett, M.C., U.S.A. *224
Animal Experimentation, The Benefits Derived by Military Medical Science from. Lieut. Col. E. B. Vedder, M.C., U.S.A. ... *411
Annual Meeting, Proceedings of the 31st ... *529
Army Medical Museum, Washington, D. C., The. Dr. D. S. Lamb *89
Arsphenamine vs. Neo-Arsphenamine, with a Report of 1609 Injections. Edward L. Merritt, M.D. *259
Association Notes 66, 178, 268, 389
Aviation as a Medical Problem. Lieut. James D. Benjamin, M.C., U.S.N. *218
Aviation Medicine, The Development of. Lieut. Col. W. R. Davis, M.C., U.S.A. ... *207
Aviation Medicine, Instruction of the Reserve and National Guard in. Maj. L. H. Bauer, M.C., U.S.A. *457

B

Bauer, L. H., Major, M.C., U.S.A. Instruction of the Reserve and National Guard in Aviation Medicine *457
Benjamin, James D., Lieut., M.C., U.S.N. Aviation as a Medical Problem *218
Blech, Gustavus M., Col., M.R.C., U.S.A. Tactics—the Therapy of Warfare *489
Blood Counting. Uniform Nomenclature for. Maj. R. E. Scott, M.C., U.S.A. and Sgt. R. W. French, U.S.A. *321
Bone, A New Method of Treatment for Chronic Infections Involving. H. Winnett Orr, M.D. ..... (C. & C.) 69
Book Reviews 77, 180, 290, 396, 508
Bradford, Flora L., R.N. Relation of the American Red Cross to the Military Surgeon *241

C

Cady, Lee B., 1st Lieut., M.O.R.C., U.S.A. Report of the Medical Committee, International Air Races *600
Carbon Monoxide in Tobacco Smoke (C. & C.) 270
Carrel-Dakin Treatment—An Improvement in Adjusting the Tubes in Superficial Wounds. Howard Lilienthal, M.D. *162
Cecil, Russell L., M.D. Specific Prevention and Specific Treatment of Lobar Pneumonia *462
Charts, Two Calculating. Maj. Cyrus B. Wood, M.C., U.S.A. *39
Chemical Warfare and Its Relation to the Medical Department. Lieut. Col. H. L. Gilchrist, M.C., U.S.A. *144
Church, James Robb, Col., U.S.A., Ret. A Possible Advance in the Treatment of Protozoal Infections of the Central Nervous System ..... (Ed.) 63
Church, James Robb ..... *309, (Obit.) 409
Citizens' Military Training Camp, The Future of the. Lieut. Col. E. L. Ruffner, M.C., U.S.A. *155
Clopton, M. B., Lieut. Col., M.O.R.C., U.S.A. Report of the Medical Committee, International Air Races *600
Cooper, A. T., Maj., M.C., U.S.A. The Use of the Yerkes-Bridges Point Scale in Intelligence Tests *15
Cutler, Elliott C., Maj., M.O.R.C., U.S.A. The Migration of a Shell Fragment from the Inferior Vena Cava to Right Pulmonary Artery—Case Report *264

D

Davis, W. R., Lieut. Col., M.C., U.S.A. The Development of Aviation Medicine .. *207
Desertion: Observations of a Psychoanalyst. Comdr. J. C. Thompson, M.C., U.S.N. ... *612
Duguet, Marie Louis Firmin, Col., French Army. General Organization of the Treatment and Evacuation of Wounded with Fractures, in the Area of the Front .. *574
Dunn, Lawrence H., Maj., S.R.C., U.S.A. Observations on the Use of a Steam Jet for Delousing Railway Coaches *42

E

Endocrines, the Influence of the, on Growth and Development. Capt. Wm. C. Porter, M.C., U.S.A. *371
Epidemiology, The Newer. Lieut. Col. Fielding H. Garrison, M.C., U.S.A. *1
Ex-Service Man and the Medical Reserve Corps Officer, the Tuberculous. Maj. R. McBrayer, M.O.R.C., U.S.A. *337

F

Forms 339 A G.O. and 71 M.D., The Forthstanding Value and Correlative Status of. Maj. N. W. Sharpe, M.O.R.C., U.S.A. (C. & C.) 73
Fractures, General Organization of the Treatment and Evacuation of Wounded with, in the Area of the Front. Col. Marie L. F. Duguet, French Army *300
Francine, Albert P., Lieut. Col., M.O.R.C., U.S.A. Is Chemical Warfare More Inhuman than Gunfire? *365
Francis, Edward, Surgeon, U.S.P.H.S. Tularaemia *164
Frank, Jacob, Col., Ill. N.G., Ret. An Efficient State Military Medical Department *58
French Medical Service During the War, 1914–1918, Statistical Data Relating to the. Col. F. M. H. Visbecq, French Army *588
French Medical Service During the Operations of August, 1917, at Verdun, Organizations of: Historical Account. Col. F. M. H. Visbecq, French Army *582

G

Garrison, Fielding H., Lieut. Col., M.C., U.S.A. The Newer Epidemiology *1
Kipling on John Hunter *141
Gilchrist, H. L., Lieut. Col., M.C., U.S.A. Chemical Warfare and Its Relation to the Medical Department *144
Gunfire, Is Chemical Warfare More Inhuman than. Lieut. Col. Albert P. Francine, M.O.R.C., U.S.A. *365

H

Hanson, Adolph M., M.D., B.A., M.A. A Plea for an Improved Steel Helmet in the Next War.....*608
Helmet in the Next War, A Plea for an Improved Steel. Adolph M. Hanson, M.D.*608

I

International Air Races, Report of the Medical Committee. Lieut. Col. M. B. Clopton and 1st Lieut. Lee D. Cady, M.O.R.C., U.S.A.....*600

K

Kipling on John Hunter. Lieut. Col. F. H. Garrison, M.C., U.S.A.....*141

L

Lamb, D. S., M.D. The Army Medical Museum, Washington, D. C..... *89
Leake, J. P., Surgeon, U.S.P.H.S. The Immunity Following Smallpox Vaccination.....*328
Leprosy in the Continental United States, What the U.S.P.H.S. Is Doing to Prevent the Spread of. Surg. Edw. R. Marshall, U.S.P.H.S.....*313
Lilienthal, Howard, M.D. Carrel-Dakin Treatment—An Improvement in Adjusting the Tubes of Superficial Wounds.....*162

M

Marshall, Edward R., Surgeon, U.S.P.H.S. What the United States Public Health Service Is Doing to Prevent the Spread of Leprosy in the Continental United States..*313
McBrayer, R., Major, M.O.R.C., U.S.A. The Tuberculous Ex-Service Man and the Medical Reserve Corps Officer.....*337
McDiarmid, N. L., Major, M.C., U.S.A. The Supply Functions of the Medical Officer..... *19
Medical Department. New Appointment and Promotion Policy for the.....(Ed.) 615
Medical Field Service School, Carlisle Barracks, Penna., The 1923 Basic Field Course of the.....(C. & C.) 391
Medical Officer, The Supply Function of the. Maj. N. L. McDiarmid, M.C., U.S.A..... *19
Medical Student for Service in Time of War, Training the. Lieut. Col. H. H. Rutherford, M.C., U.S.A.....*442
Meeting of the British Medical Association in Which Points of Importance to the Air Service Medical Officer Were Discussed, Papers Presented at the.....(C. & C.) 503
Merritt, Edward Lester, M.D. Arsphenamine vs. Neo-Arsphenamine, with a Report of 1609 Injections.....*259
Military Order of the World War..(C. & C.) 75
Military Surgeon, Relation of the American Red Cross to the. Sarah Elizabeth Pickett and Flora L. Bradford, R.N.....*241

N

Neblett, H. C., Major, M.C., U.S.A. Chronic Infection of the Teeth and Gums as a Cause of Staleness in Air Service Pilots...*224
A Case of Retinal Detachment in a Pilot of the Air Service, U. S. Army.....*605

O

Observation Trip in Germany, Denmark and England, Report of an. Maj. M. A. Reasoner, M.C., U.S.A.....*344
Officers' Reserve Corps in Sections of the Medical Department of the Army, Policy Governing Appointment and Promotion in the.....(C. & C.)*616
Organized Reserves, Units of..(C. & C.) 75, 287
Orr, H. Winnett, Lieut. Col., M.O.R.C., U.S.A. A New Method of Treatment for Chronic Infections Involving Bone (C.&C.) 69

P

Patient, Examination of the. Major T. E. Scott, M.C., U.S.A..... *45
Pickett, Sarah Elizabeth, R.N. Relation of the American Red Cross to the Military Surgeon.....*241
Pneumonia, Specific Prevention and Specific Treatment of Lobar. Russell L. Cecil, M.D.....*462
Porter, Wm. C., Capt., M.C., U.S.A. The Value of Tests for Intelligence in Applicants for Enlistment.....*230
The Influence of the Endocrines on Growth and Development.....*371
Protozoal Infections of the Central Nervous System, A Possible Advance in the Treatment of.....(Ed.) 63

R

Reasoner, M. A., Major, M.C., U.S.A. Report of an Observation Trip in Germany, Denmark and England.....*344
Retinal Detachment in a Pilot of the Air Service, U. S. Army, A Case of. Maj. H. C. Neblett, M.C., U.S.A.....*605
Ruffner, E. L., Lieut. Col., M.C., U.S.A. The Future of the Citizens' Military Training Camp.....*155
Rutherford, Henry H., Lieut. Col., M.C., U.S.A. Training the Medical Student for Service in Time of War.....*442

S

Scott, R. E., Maj., M.C., U.S.A. Uniform Nomenclature for Blood Counting.....*321
Scott, T. E., Maj., M.C., U.S.A. Examination of the Patient..... *45
Sharpe, Norvelle Wallace, Maj., M.O.R.C., U.S.A. The Forthstanding Value and Correlative Status of Forms 339 A.G.O. and 71 M.D.....(C. & C.) 73
The National Psyche vs. Toxic Chemical Warfare—A Vulnerable Sector in the Line of National Defense.....*470
Shell Fragment, the Migration of, from the Inferior Vena Cava to Right Pulmonary Artery—Case Report. Maj. Elliott C. Cutler, M.O.R.C., U.S.A.....*264
State Military Medical Department, An Efficient. Col. Jacob Frank, M.C., Ill. N.G., Ret..... *58
Steam Jet for Delousing Railway Coaches, Observations on the Use of a. Maj. Lawrence H. Dunn, S.C., U.S.A..... *42

T

Tactics—The Therapy of Warfare. Col. Gustavus M. Blech, M.O.R.C., U.S.A....*489
Tasker, Arthur N., Maj., M.C., U.S.A. An Early Epidemic of Typhoid Fever among Soldiers.....*252
Tests, Intelligence, The Use of the Yerkes-Bridges Point Scale in. Maj. A. T. Cooper, M.C., U.S.A..... *15
Tests for Intelligence in Applicants for Enlistment, The Value of. Capt. Wm. C. Porter, M.C., U.S.A.....*230
Thompson, J. C., Comdr., M.C., U.S.N. Desertion: Observations of a Phycho-analyst.....*612
Tularaemia. Surg. Edward Francis, U.S.P.H.S.....*164

Typhoid Fever among Soldiers, An Early Epidemic of. Maj. Arthur N. Tasker, M.C., U.S.A.....*252

V

Vaccination, The Immunity Following Smallpox. Surg. J. P. Leake, U.S.P.H.S.....*328
Vedder, Edward B., Lieut. Col., M.C., U.S.A. The Benefits Derived by Military Medical Science from Animal Experimentation...*411
Visbecq, Fernand M. H., Col., French Army. Organization of the French Medical Service During the Operations of August, 1917, at Verdun: Historical Account.....*582

Statistical Data Relating to the French Medical Service during the War, 1914–1918.....*588

W

Warfare, The National Psyche vs. Toxic Chemical Warfare—A Vulnerable Sector in the Line of National Defense. Maj. N. W. Sharpe, M.O.R.C., U.S.A.....*470
Wellcome First Prize Essay, 1923.....*411
Wellcome Second Prize Essay, 1923.....*442
Wood, Cyrus B., Maj., M.C., U.S.A. Two Calculating Charts..... *39

BINDING LIST JUL 15 1933

RD
1
M38
v.53

Military medicine

Biological
& Medical
Serials

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY